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Bibliography on Atmospheric Turbulence and "Bumpiness" in Flight, p. 1185

3 November, 1952 No. 11

METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

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***EDITORIAL OFFICE:** Washington, D. C. **P.O. ADDRESS:** Box 1736, Washington 13, D. C. Telephone: REpublic 6278.

ADMINISTRATIVE OFFICE: American Meteorological Society, Office of Executive Secretary, 3 Joy Street, Boston 8, Mass.

* Address all business communications, orders and inquiries to the Executive Secretary, Mr. Kenneth C. Spengler, 3 Joy Street, Boston 8, Mass. Exchanges and reprints may be sent direct to P. O. Box 1736, Washington 13, D. C.

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METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

MALCOLM RIGBY, Editor

Vol. 3 NOVEMBER 1952 No. 11

SPECIAL FEATURE IN THIS ISSUE

A Selective Annotated Bibliography on Atmospheric Turbulence and "Bumpiness" in Flight

(For complete table of contents see back cover)

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FOREWORD

Meteorological Abstracts and Bibliography is a monthly publication whose purpose is to bring to the attention of meteorologists current literature in their field and in related fields and to provide bibliographic information on various subjects, as interest demands.

Part I contains from 175 to 300 abstracts of current periodical literature and monographs in the fields of meteorology, hydrology, oceanography, etc. These abstracts are arranged according to the Universal Decimal Classification.

Part II of each issue comprises a special annotated bibliography of from 50 to 250 important references on a special subject without respect to recency of material. No attempt is made to prepare exhaustive bibliographies; instead, the aim is to include a representative cross section of the various aspects of a subject. Preference is given to recent material, comprehensive works, material from obscure sources, and items with good bibliographies.

Bibliographies previously published were:

No.	Mo.	Vol. I, 1950	Vol. II, 1951
1.	Jan.	**Atmospheric Pollution**	**Extended Forecasting**
2.	Feb.	**Aerobiology**	**Long Range Forecasting**
3.	March	**Cloud Physics and "Rain Making"**	**Soil Temperature**
4.	April	**Hail**	**Constants, Units, Tables and Diagrams**
5.	May	**Tornadoes**	**Climate of the Near East**
6.	June	**Volcanic Dust**	**Climate of the Middle East**
7.	July	**Climatic Changes**	**Special Winds**
8.	Aug.	**Thunderstorms**	**Radar Storm Detection**
9.	Sept.	**Icing**	**Condensation Trails**
10.	Oct.	**Acoustical Propagation**	**Climate of Northeast Africa**
11.	Nov.	**Evaporation**	**Mountain Meteorology**

Bibliographies published this year were:

1. **Climatology of Northwest Africa,** Vol. III, No. 1, Jan. 1952
2. **Carbon Dioxide,** Vol. III, No. 2, Feb. 1952
3. **Climate of Paraguay, Uruguay and Argentina,** Vol. III, No. 3, March 1952
4. **Dew,** Vol. III, No. 4, April 1952
5. **Objective Forecasting,** Vol. III, No. 5, May 1952
6. **Stratus Forecasting,** Vol. III, No. 6, June 1952
7. **Urban Climatology,** Vol. III, No. 7, July 1952
8. **Climate of Central and West Africa,** Vol. III, No. 8, Aug. 1952
9. **Visibility,** Vol. III, No. 9, Sept. 1952
10. **Glaze and Rime,** Vol. III, No. 10, Oct. 1952
11. **Free Air Turbulence,** Vol. III, No. 11, Nov. 1952

Other bibliographies in preparation are:

Actinometers
Arctic Meteorology
Auroral Physics
Climate and Cancer
Climate of Australasia
Climate of Southeast Asia and the East Indies
Climate of the Pacific Ocean Area
Frost and Frost Forecasting
High Level Winds
Machine Methods in Meteorology
Microwave Propagation
Oceanographic Meteorology
Ozone
Snow Cover
Tropical Cyclones
Tropopause Variations
Turbulence

Part III contains a listing of the contents of those journals which are primarily meteorological. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes. In the June and December issues cumulative indexes are published.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where th material may be found. The Union List of Serials (Gregory) is the source of most of th symbols used. In some cases, where no symbol has been assigned to a library, one will b devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DSG:	U. S. Army Medical Library, Washington, D. C.
DSI:	Smithsonian Institution Library, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.
GB-MO:	Great Britain, Meteorological Office Library, Harrow, England.
MH-BH:	Harvard University, Blue Hill Observatory (and American Meteorologica Society) Library, Milton, Mass.
NN:	New York Public Library, New York, N. Y.
NNA:	American Geographical Society Library, New York, N. Y.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
§	before an entry indicates a synoptic case history study accompanied by chart

Geographic locations are in the English form rather than the form used locally, for exampl Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless otherwi stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet according to th Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months a abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Numb (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus a entry will read as follows:

Meteorologische Rundschau, 2(5–6):146–151, May–June 1950.

This indicates that the article appeared in *Meteorologische Rundschau*, *Jahrgang* 2 (V 2), *Heft* 5–6 (No. 5 and 6), *pages* 146–151, May–June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL MATERIAL

WORKS OF SPECIAL INTEREST

3.11–1 551.57:551.577.37

†Fletcher, Robert D. (*U. S. Weather Bur., Wash., D. C.*), **Hydrometeorology in the United States.** (In: **Compendium of meteorology.** Boston, American Meteorological Society, **1951.** p. 1033–1047. 3 figs., 34 refs., 9 equations.) **MH-BH**—A comprehensive review of the theoretical basis of hydrometeorology, the principal problem of which is the determination of the maximum possible precipitation over any given area, is presented. The empirical and theoretical apparatus for determining the relationship between rainfall intensity and duration are compared and the fundamental theoretical approaches to expressing quantitatively the relationship between depth-duration of rainfall and meteorological factors are discussed. The derivation of the equation for expressing the precipitable water content of the air and its limitations and the use of the equation of moisture continuity and of the storage equation in predicting maximum possible precipitation are presented. The determination of rainfall intensity of orographic rainfall by empirical statistical procedures and by the use of theoretical barrier models and the computation of spillover; and the estimation of maximum possible precipitation over a drainage area resulting from nonorographic rainfall by techniques involving 1) the introduction of storm transportation values, 2) storm "adjustment values," 3) the utilization of isobar-isotherm relationships and 4) statistical empirical relationships are taken up in considerable detail. The importance of rainfall probabilities, the estimation of isohyetal patterns and their variations with time and of recurrence intervals, the seasonal distribution of rainfall, the estimation of snow melt and the causes and behavior of wind tides and phenomena in reservoirs, all of which are phenomena with which hydrometeorology is concerned, are reviewed. Future progress in hydrometeorology depends upon the systematic organization and use of existing data, increasing the number of rainfall reporting networks and research on wind behavior, on the use of the equations of motion and of energy relationships and on turbulence. *Subject Headings:* **1. Hydrometeorology 2. Maximum possible precipitation.**—*I.L.D.*

3.11–2 551.521

†Fritz, Sigmund (*U. S. Weather Bureau, Wash., D. C.*), **Solar radiant energy and its modification by the earth and its atmosphere.** (In: **Compendium of meteorology.** Boston, American Meteorological Society, **1951.** p. 13–34. 11 figs., 7 tables, 79 refs., 26 equations.) **MH-BH**—Although the sun radiates essentially as a black body at 6000°K in the spectral region from .45 to 24μ, it radiates far below that temperature in the UV (2200–3000Å) if rocket data are correct. At infrared wave length a black body temperature of 7000Å is indicated, and at cm wave lengths and possibly at $<$1000Å in the extreme UV a hot sun (10^6K) is postulated. No measurements are available for 24μ to 1 cm. Fluctuations in special radiation are of importance in radio propagation, weather, etc. Sudden ionospheric disturbances (SID's) are also of extreme importance and reveal the characteristics of the ionosphere, ozonosphere and the causes for changes in the structure of the stratosphere, though probably not the troposphere. Variations in measured intensity may be due as much to variations in transmissivity of a variable atmosphere as in output by the sun due to flocculi or faculae. Detailed consideration is given to the measurement of and variations in the solar constant, in absorption by the atmosphere (ionosphere, ozonosphere, water vapor, clouds), in scattering by atmosphere (water vapor, dust, etc.), albedo (clear and cloudy atmosphere, earth's surface). *Subject Headings:* **1. Solar radiation 2. Solar constant 3. Albedo.**—*M.R.*

3.11–3 551.575

†George, Joseph J. (*Eastern Air Lines, Atlanta, Ga.*), **Fog.** (In: **Compendium of meteorology.** Boston, American Meteorological Society, **1951.** p. 1179–1189. 11 figs., 26 refs.) **MH-BH**—The phenomena of fog, smoke and haze are differentiated and defined. The physics of fog formation, in particular the role of condensation nuclei; the size distribution and liquid water content of the fog particles; low temperature fogs and the formation of fog over snow cover and radiation and heat balance of fog situations are outlined. WILLETT's classification of fog as modified by BYERS is presented and is used as a basis for forecasting whereby all classes which are not of direct forecasting value are eliminated. These eliminated classes, namely land and sea breeze fog, storm fog, upslope fog, postfrontal (cold-front) fog, advection radiation fog and radiation fog are described. The techniques applicable to forecasting advection fog (sea fog), radiation (restricted heating) fog, radiation (air drainage) fog, advection radiation fog, pre-warm frontal fog, mixing-radiation fog, and estimating the time required to dissipate fog or stratus are described. In addition to local synoptic studies in fog the author points to the need for investigations of 1) the vertical structure of the lowest atmospheric layer in order to determine the distribution of temperature and humidity and their changes during fog formation, 2) diurnal changes in wind direction and velocity and the relation of vertical shear to stability considerations; and of surface characteristics such as radiative properties of different ground covers and interdiurnal variations in lake and ocean temperatures. *Subject Headings:* **1. Fog 2. Condensation nuclei 3. Fog classification 4. Fog forecasting.**—*I.L.D.*

3.11–4 551.574.1:551.575:551.578.71

†Houghton, Henry G. (*Mass. Inst. of Tech.*), **On the physics of clouds and precipitation.** (In: **Compendium of meteorology.** Boston, American Meteorological Society, **1951.** p. 165–181. fig., 4 tables, 58 refs.) **MH-BH**—A thorough and lucid discussion of the particular phase of physical meteorology which deals with the physical processes of natural (as distinguished from artificial) condensation and precipitation. The source, physical and chemical properties, size and frequency distribution, and role of condensation nuclei in the initial phase of condensation; the growth of cloud drops; the methods of measurement of drop size and liquid water content, and data from such measurements; the physical processes of supercooling of water and water vapor, condensation and sublimation below 0°C, precipitation mechanisms, processes of snow, hail and ice cloud formation, size of raindrops, and, finally, the artificial dissipation of fog are taken up in successive chapters or paragraphs. The most important literature on these subjects is included in the excellent bibliography, and the contributions of various authors in each field are cited and evaluated historically. Three methods of artificial fog dissipation are described (heating, desiccation and use of charged sand). The first two methods actually require about ten times as much energy as the theoretical minimum. Further research is needed to reduce this uneconomical factor. Also knowledge of the ice phase, of the role of freezing and sublimation nuclei, and of the growth of drops by collision in a gravitational field which can be studied intensively in the laboratory and in the free atmosphere are reviewed. *Subject Headings:* **1. Cloud physics 2. Fog dissipation 3. Hail formation 4. Ice phase.**—*M.R.*

3.11–5 551.574.7

†Lewis, William (*U. S. Weather Bureau, Wash., D. C.*), **Meteorological aspects of aircraft icing.** (In: **Compendium of meteorology.** Boston, American Meterorological Society, 1951. p. 1197–1203. 4 tables, 19 refs., 3 equations.) **MH-BH**—The physical characteristics of icing conditions as determined by the parameters of liquid water concentration, drop diameter and temperature; the importance of temperature and drop size in determining the severity of icing for the various components of an aircraft as a result of the variation of the kinetic temperature rise with air speed and the dependence of collecting efficiency upon drop size, air speed and shape of the object; the definition of icing intensity on the basis of the U. S. Weather Bureau scale; and the methods of measuring liquid water concentration and drop size diameter are discussed. The physical processes determining the concentration of liquid water in clouds and the consequent formation of clouds by convection (cumulus and cumulonimbus); by turbulence (stratus and stratocumulus) and by horizontal convergence (altostratus, altocumulus and altocumulus-altostratus); the meteorological conditions responsible for freezing rain and freezing drizzle and statistical data on liquid water concentration and drop size in

various types of clouds are summarized. The icing conditions likely to be found in various types of clouds and the problem of forecasting icing conditions in clouds of known type, dimensions and temperature and of flight planning and dispatching in relation to icing conditions are outlined. Problems for further research are recommended and the possible use of ice seeding to reduce icing hazard near airports, single automatic apparatus for determining liquid water concentration and mean drop size conditions under which ice crystals are formed and distribution of drop size in clouds discussed. (*Same item as* I-172, Sept. 1950, *MAB.*) *Subject Headings:* **1. Icing of aircraft 2. Icing prevention 3. Liquid water content of clouds 4. Drop size distribution.**—*I.L.D.*

3.11–6 551.521.61

†Möller, Fritz (*Gutenberg Univ., Mainz, Germany*), **Long-wave radiation.** (In: **Compendium of meteorology.** Boston, American Meteorological Society, **1951.** p. 34–49. 5 figs., 4 tables, 51 refs., 18 equations.) **MH-BH**—It was formerly thought that study of long wave radiation in the atmosphere would solve the problem of variations (with latitude and time) in the height and temperature of the tropopause or of other inversions. Today the emphasis is more on the radiative balance and heat budget of the atmosphere. The three radiators are H_2O, CO_2 and O_3 for the wave lengths from 4 to 100μ. First the theory of absorption and scattering is outlined and formulated. Then radiation diagrams of ELSASSER and MÖLLER, and their theoretical basis, are explained and use illustrated. Deficiencies between the two diagrams are mainly in the evaluation of CO_2 absorption (both as to amount and spectral boundaries) and in numerical values of the absorption coefficient K_0, and the absorption function for a given line. Downward and outgoing radiation are both considered in detail from theoretical and empirical standpoint. Calculations of F. A. BROOKS and G. D. ROBINSON along these lines are evaluated. The effect of pressure on the absorption coefficient is not great in the lower 500 m of the atmosphere where 88% of the downward short wave radiation originates, but in the higher layers the effect of the narrowing of the spectral lines is significant. The mean absorption coefficient is reduced in proportion to $\sqrt{p/p_0}$ and the factor $\mu=\sqrt{p/p_0}$ is usually applied, not to K, but to the radiating mass m or the densities of water vapor and CO_2. This correction must be applied in all studies of radiative balance in the atmosphere. The author proposes a new factor to apply to the vapor density for use in standard absorption equations, namely $\mu=.985(p/p_0)^{0.8}+.015(p/p_0)^{-1}$. This factor has a minimum at 100 mb and increases above that, but the levels above 100 mb have little water vapor so do not affect total balance. Radiation from haze layers below tropopause must also be considered. Effect of clouds on radiation and vice versa, are complicated. Also polar tropopause is probably caused by radiation from water vapor layers, whereas in the tropical tropopause the layer of maximum cooling lies 4–5 km below the tropopause, so the mechanism of its formation as well as its structure are probably different. BRUINENBERG has constructed tables which allow direct numerical calculations of radiation balance or other problems, without use of diagrams. In the stratosphere, problems are of a different nature. Chemical rather than physical changes occur rapidly, so that the deficiency in knowledge of atmospheric composition more than offsets the simplification due to lack of water vapor, clouds and haze. As H_2O becomes less important, CO_2 and O_3 become more so. The author used a reductive factor of $\mu=(p/p_0)^{.74}$ for CO_2 instead of ELSASSER's $\sqrt{p/p_0}$ law, and obtained a maximum cooling effect at 26 km with cooling of 1.5 to 2°C per day, assuming a CO_2 content of .03%. Ozone has an intense absorptive band at 14μ also, so there is likely a strong interaction of O_3 and CO_2 absorption and emission. GOODY suggests H_2O, O_3 and CO_2 balance as cause of both polar and tropical tropopause. *Subject Headings:* **1. Infrared radiation 2. Carbon dioxide absorption 3. Ozone absorption 4. Radiation diagrams 5. Tropopause formation. I. Elsasser, W. M.**—*M.R.*

3.11–7 551.510.535

Seaton, S. L., **The ionosphere.** (In: **Compendium of meteorology.** Boston, American Meteorological Society, **1951.** p. 334–340. 3 figs., 4 refs., 6 equations.) **MH-BH**—A general outline of the structure of the ionosphere as well as the history and methods of investigation are given for meteorologists not familiar with the research work in this field.

Despite the fact that GAUSS showed that there should be a region of high electrical conductivity in the upper atmosphere, the direct evidence of this region was obtained only in 1925. The probable distribution of ionization is shown and the occurrence of the different regions is discussed. Above the F2 region a G region may be present. The author states that from the meteorological standpoint the ionosphere appears to have immense possibilities, but no sure results have as yet been obtained. The ionospheric temperatures are not known sufficiently, but it is probable that the temperature variations are very great. *Subject Heading:* **1. Ionosphere.**—*A.A.*

3.11–8 551.46(02)

†Snezhinskiĭ, V. A., **Prakticheskaia okeanografiia (raboty v otkrytom more).** [Practical oceanography (for work in the open ocean).] Leningrad, Gidromet. Izdat., **1951.** 599 p. ports., 371 figs., 37 tables, 140 refs. **DLC**—The most recent and practical textbook on methodology of oceanographic research, with emphasis on work of Russian or Soviet scientists. The history of various types of investigations of the seas, stations, expeditions and cross sections, basic observations, methods and accuracy of observations are given due attention, but the main part of the work (and illustrations) has to do with instruments—apparatus for physical, chemical and biological observations in the oceans. The text is divided into six main parts comprising 17 chapters. The first part deals with organization, preparation and completion of oceanographic work; Pt. II with oceanographic sounding equipment of four general types; Pt. III with soundings at great depths of water and varying bottom conditions; Pt. IV with movements of sea water (currents, waves and tides or sea level movements); Pt. V with temperature, salinity and transparency (optics) of sea water and Pt. VI with studies of the energy exchange of the sea. The last part contains two chapters, one on actinometric observations at sea and one on evaporation and convective heat exchange. The instruments and devices used by the Russian oceanographers, the calibration and accuracy of the instruments, and the recording and computation of results are all described and illustrated in great detail. *Subject Headings:* **1. Oceanographic instruments 2. Oceanographic observations 3. Soviet science.**—*M.R.*

3.11–9 551.5:63(02)

Suzuki, Seitaro, **Nogyo kishogaku.** [Agricultural meteorology.] Tokyo, Yokendo, **1951.** 267 p. numerous figs., tables, ref. In Japanese. **DA**—This is the first Japanese text of its kind to come to our attention. In the 15 chapters the several aspects of physical and synoptic meteorology are taken up quantitatively with respect to specific agricultural problems, such as frost, crop development or production, etc. Radiation, soil temperature and moisture, evaporation, rainfall, air masses, cold fronts, local air drainage and microclimatic factors constitute meteorological variables treated. *Subject Headings:* **1. Agricultural meteorology 2. Textbooks 3. Japanese language.**—*M.R.*

3.11–10 551.5(02)

†Tverskoĭ, Pavel Nikolaevich (*ed.*), **Kurs meteorologii (fizika atmosfery).** [Course in meteorology (physics of the atmosphere).] Leningrad, Gidromet. Izdat., **1951.** 887 p. 343 figs., 110 tables, equations, bibliog. p. 862–869. **DLC**—The 49 chapters of this monumental textbook on synoptic, dynamic and physical meteorology, are divided into nine major parts (plus 31 pages of introduction, and 10 appended working tables). The first part takes up in 7 chapters the "Structure and physics of the atmosphere" (thermodynamics, temperature, pressure, wind and moisture fields, clouds, fog and precipitation). Pt. II treats of "Radiant energy" (effect of atmosphere, short wave, long wave and radiative balance). Pt. III on "Thermal regime of atmosphere" contains 6 chapters (heat transfer, turbulent exchange, heat balance of sea, earth and lower atmosphere, heat regime of soil and water temperature of microclimatic layer and of free atmosphere). Pt. IV on "Water in the atmosphere" takes up atmospheric motions, wind at surface and aloft, boundary layers, lapse rates, local and general circulation, relation of pressure, temperature and wind. Pt. VI "Weather and its prediction" discusses synoptic method, air masses, frontal zones, cyclones and anticylones, general circulation, short and long range forecasts and weather and climate. Pt. VII "Optical phenomena in the atmosphere" has separate chapters on twilight and other polarization phenomena, visibility,

refraction in the atmosphere and halos, etc. Pt. VIII is on "Atmospheric electricity" (ionization, ionosphere, thunderstorm electricity and auroras). Pt. IX "Atmospheric acoustics" takes up ordinary acoustical problems and anomalous propagation of sound. The bibliography gives an extensive list of references (all Russian) for each chapter. Several of the references are to standard western texts translated into Russian. *Subject Headings:* **1. Meteorology 2. Dynamic meteorology 3. Synoptic meteorology 4. Physical meteorology 5. Textbooks 6. U.S.S.R. I. Zverev, A. S. II. Kiriukhin, B. V. III. Kondrat'ev, K. IA. IV. Selezneva, E. S. V. IUdin, M. I.**—*M.R.*

3.11–11 551.510.53:61

†U. S. School of Aviation Medicine, Randolph Field, Texas, **Physics and medicine of the upper atmosphere: a study of the aeropause.** The Proceedings of a symposium on the physics and medicine of the upper atmosphere held at San Antonio, Texas, Nov. 6–9, 1951. Editors: Clayton S. White and Otis O. Benson, Jr. Albuquerque, University of New Mexico Press, **1952.** 611 p. 150 figs., tables, 46 plates, refs. at the end of most chapters. Price: $10.00. **DLC**—The contents of this volume contribute a survey of existing unclassified information essential to a background for planning research on manned flight toward the top of the atmosphere, namely the aeropause. They represent the contributions of physics, meteorology, astrophysics, aeronautics, engineering, biology, physiology and biophysics towards an understanding of the stresses imposed by the environment of the aeropause upon man and materiél. The broad topics reviewed are: the physical and chemical properties of the upper atmosphere; biologic effects of ultraviolet and cosmic radiation and of X-rays; methods and vehicles for research in the high atmosphere, in particular, the use of rockets and their characteristics, parachute recovery and telemetering; known and predicted problem of human travel in the aeropause; and human tolerance for temperature extremes. The individual articles are illustrated and provided with bibliographies. The appendix contains conversion tables for measurement of length and for temperature and plates illustrating rocket launching, rocket-borne apparatus, meteorite craters and damage caused by meteorites, etc. The individual contributions will be abstracted separately. *Subject Headings:* **1. Aeropause 2. Atmospheric composition 3. Radiation 4. Rockets 5. Upper atmosphere research 6. Medical meteorology 7. Exosphere. I. White, Clayton S.** (*ed.*) **II. Benson, Otis O., Jr.** (*ed.*) **III. Lovelace Foundation for Medical Education and Research, Albuquerque, N. M.**—*I.L.D.*

GENERAL METEOROLOGY

(*See also items:* 3.11–9, 3.11–10)

3.11–12 551.5 551.509.3

Bartlett, D. and Bartlett, K., **Signpost to the weather.** London, Edward Stanford, Ltd., **1949.** 120 p. 63 figs. **DLC**—A clever popular "guide" to meteorology and amateur forecasting (both short and long ranges) by the "Two Famous Forecasters" and "Long-range Weather Experts," D. and K. Bartlett (professional weather consultants since 1935). The emphasis is on conditions in the British Isles, and the dozens of charts and tables applying to climatic conditions, extremes, etc. for Great Britain are authentic though necessarily crude. A section devoted to winter months gives many items of information about unusual spells of weather in the past. The schematic diagrams give numerous illustrations of the type usually found in training manuals. *Subject Headings:* **1. Elementary meteorology 2. Amateur forecasting 3. Great Britain.**—*M.R.*

3.11–13 551.5(01)

Defrise, Pierre, **Propos sur la météorologie.** [Discourse on meteorology.] *Ciel et Terre*, 67(7/8):134–139, July/Aug. **1951.** 9 refs. **DWB**—A philosophical discussion of classification of science with reference to meteorology and climatology. Emphasis is placed on variations with space and time of individual and collective parameters, the idea of scale in synoptic meteorology and climatology (for example the scale of turbulence both large and small, of precipitation or temperature variations, etc.) and the methods of recording or representing

the measurements, statistical methods, laws governing the mathematics or physics of the scale, etc. *Subject Headings:* **1. Meteorological philosophy 2. Classification of science.**—*M.R.*

3.11–14 551.5(02,04) 551.509.34:551.508

Schneider, Herman (*N. Y. City Elem. Sch. System*), **Everyday weather and how it works.** New York, Whittlesey House, **1951.** 189 p. illus., diagrs. (Popular article in Life.) **DWB**—A remarkably thorough and technically accurate though elementary review of the principles on which weather forecasts are based, the general concepts of meteorology (air masses, fronts, storms, clouds, hydrometeors, etc.) and the practical details of constructing a weather station (wind vane, anemometer, hygrometer, barometer and rain gage) at a cost of 50 cents, using 4 milk cartons, 5 caps, 2 coat hangers, 3 paper clips, 6 tacks, 2 pennies, a match, 2 eye droppers, a tin can, spool of thread, 2 needles, 2 rubber bands, a human hair and some other pieces of junk. Each step is illustrated and, finally, the use of the equipment in amateur forecasting is described with no sensational claims as to accuracy. *Subject Headings:* **1. Amateur forecasting 2. Amateur weather instruments 3. Elementary meteorology 4. Textbooks. I. Bendick, Jeanne, (*illus.*).**—*M.R.*

3.11–15 551.5(058) 551.579(058)

Sweden. Meteorologiska och Hydrologiska Institut, **Arsberättelse för 1949.** [Annual report, 1949.] Stockholm, **1950.** 26 p. English summary p. 23–26. Price: 1 kr. **DLC**—The report covers the changes in personnel that took place in the meteorological service, the activity of the forecasting service, gale warning service and the aerological section and the establishment of aerological stations, the climatological section and the aeronautical service. Also the year's accomplishments of the Hydrological Institute are described. *Subject Headings:* **1. Meteorological services 2. Hydrological services 3. Annual reports 4. Sweden.**—*I.L.D.*

3.11–16 551.5(09)(485)

†Ångström, Anders, **Report on Swedish meteorological research 1939–1948.** *International Union of Geodesy and Geophysics. Association of Meteorology, Oslo, 1948, Procès-verbaux* 3:197–205, Nov. **1950.** 28 refs. In English. **DWB**—Summary of well known research by Nyberg, Palmén, Markus Båth, Ångström, Liljequist, Köhler and others in Sweden during the war years. *Subject Headings:* **1. Meteorological research 2. Sweden.**—*M.R.*

3.11–17 551.5(09):551.50

Kovačević, Milan, **Historijski pregled meteoroloških opažanja.** [Historical sketch of meteorological observations.] *Yugoslavia. Hidrometeorološka Služba. Hidrometeorološki Glasnik,* 1(1):35–46, **1948.** In Croatian. **DWB**—Evidence of astronomical and meteorological observation is traced back as far as 4000 B.C. Communications of meteorological interest are found in ancient Greek, Roman and medieval literature. Scientists and explorers of the 17th-century are mentioned. An international network of meteorological stations was organized in 1654 by Italians. A brief survey of the development of European networks, particularly those in the territory of the present Yugoslavia, is made. Objectives, method and means and organizational problems of modern meteorological observatories, and 1st to 4th class stations are discussed in Sec. 2 of the article. *Subject Headings:* **1. History of meteorology 2. Meteorological networks.**—*G.T.*

3.11–18 551.5(26)(02) 551.4

Rouch, Jules Alfred Pierre, **Météorologie et physique du globe. Vol. 1. Météorologie nautique.** [Meteorology and physics of the globe. v. 1. Marine meteorology.] Paris, Société d'Éditions Géographiques, Maritimes et Coloniales, **1950.** 177 p. 29 figs., folio maps, 2 tables, addendum. **DWB** Written by a mariner for mariners, this book represents some forty years of meteorologically valuable observations at sea. After introductory chapters on the atmosphere, observational methods and general notions about marine climatology, special treatment is given to weather maps, behavior of certain weather elements and forecasting at sea. Certain handy tables, such as reduction of pressure to sea level, cloud types and description, and temperature at chosen ports, are included. *Subject Headings:* **1. Oceanography 2. Marine meteorology 3. Manuals.**—*M.P.K.*

3.11–19 551.5:06:551.46(44)

Francis-Boeuf, Claude, **Le Centre de Recherches et d'Études Océanographiques (C.R.E.O.) dans ses relations avec la Météorologie Nationale.** [The relations of the Center of Oceanographic Research and Study (C.R.E.O.) with the National Meteorological Service.] *La Météorologie*, 4th Ser., No. 24:235–242, Oct./Dec. **1951.** French, English and Spanish summaries p. 235. **DWB**—The analogous observational methods and general research problems in oceanography and meteorology are remarked and the aims of the C.R.E.O. listed. The author thanks the French Météorologie Nationale for its cooperation to date and expresses the hope that through continued cooperation organized oceanography may evolve in France. *Subject Headings:* **1. Meteorological services 2. Oceanographic institutes 3. France. I. Centre de Recherches et d'Études Océanographiques II. France. Météorologie Nationale.**—*M.P.K.*

3.11–20 551.5:06

Landsberg, Helmut E., **Activities of the Geophysics Research Division, AFCRC.** *Weatherwise*, 5(3):55–58, June **1952.** 4 figs. **MH-BH**—The scientific studies include research on the ionosphere, cloud physics, the general circulation, long and short range forecasting, turbulence in the upper atmosphere, etc. The various laboratories of the GRD are listed and the locations of GRD contractors are shown on a map. A photograph of the architect's drawing of the Air Force Cambridge Research Center (of which GRD is a branch) to be built at Bedford, Mass., is shown. *Subject Headings:* **1. Meteorological research 2. U. S. Air Force Cambridge Research Directorate. Geophysics Research Division.**—*I.L.D.*

3.11–21 551.5:06

Rossby, Carl-Gustav, **Note on cooperative research project.** *Tellus*, Stockholm, 3(3):212–216, Aug. **1951. MH-BH**—The role of individual and of cooperative research in the present and future developments of basic and applied meteorology is considered and the relative merits of each type of approach are evaluated. The need for the development of cooperative research in Europe, and the problems facing it and linguistic barriers and nationalism are discussed. A brief survey of the Stockholm program of cooperative research in meteorology is given. *Subject Headings:* **1. Meteorological research 2. Meteorological organizations 3. Sweden.**—*I.L.D.*

3.11–22 551.5:06(436)

von Ficker, Heinrich (*Dir. Austrian Z. für Met. und Geodyn.*), **Die Zentralanstalt für Meteorologie und Geodynamik in Wien, 1851–1951.** [The Central Institution for Meteorology and Geodynamics at Vienna, 1851–1951.] Vienna, Österreichische Staatsdruckerei, **1951.** 32 p. ports. **DWB**—After an introductory explanation of how and why the institution originated in 1851, its history and development are traced through both world wars and the intervening years. The successive directors are mentioned and their particular contributions to the expansion of the organization and the publication of its work noted. Development of special services (seismic, magnetic, astronomical) related to the Central Institution are included as is a list of old publications. *Subject Headings:* **1. Austria. Zentralanstalt für Meteorologie und Geodynamik 2. Meteorological organizations 3. Publication lists 4. Vienna, Austria.**—*M.P.K.*

3.11–23 551.5:37(47)

Lisachenko, F. P., **O rabote tsentral'nykh kursov.** [On the work of the central training courses.] *Meteorologiia i Gidrologiia*, No. 1:77–78, Sept. **1950. DLC**—Report on special training for 24 people, 9 of whom were the directors, 7 asst. directors, 4 heads of departments and 8 women officials of the Hydrometeorological Service. The first course began April 4 and ended June 29, 1950. The main purpose of this course seems to be administrative and economic indoctrination, not technical competency. It is proposed that these courses be made a permanent feature. *Subject Headings:* **1. Teaching of meteorology 2. U.S.S.R.**—*M.R.*

3.11–24 551.5:37(02)

Voigts, Heinrich, **Die Meteorologie in den Physik- und Erdkunde-Lehrbüchern für die höheren Schulen.** [Meteorology in physics and geography textbooks for higher schools.]

Meteorologische Rundschau, 5(3/4):59–63, March/April, **1952.** table, 27 refs. **DWB**—After an introduction on importance and scope of school meteorology, 13 physics textbooks are analyzed in detail and 5 geography books discussed. *Subject Headings:* **1. Teaching of meteorology 2. Textbooks.**—*C.E.P.B.*

3.11–25 551.5:551.46

Aliverti, Guiseppina, **L'atmosfera e gli oceani, analogie e interdipendenze.** [The atmosphere and the oceans, analogies and interdependencies.] *Rivista di Meteorologia Aeronautica*, Rome, 11(2):3–12, April/June, **1951.** 12 figs., 4 refs. Italian, French, English and German summaries p. 3. **MH-BH**—A review of the main contributions to meteorology by oceanographers and vice-versa. The particular contributions of DEFANT, BJERKNES, PETTERSON, SVERDRUP and JACOBS are discussed and several of their charts reproduced to illustrate the temperature distribution in the sea, radiation and energy exchange between sea and atmosphere. The analogies between the two sciences and the need for meteorologists to broaden the scope of their research is stressed. *Subject Headings:* **1. Marine meteorology 2. Energy exchange between sea and atmosphere.**—*M.R.*

3.11–26 551.5:656.7

Schweitzer, H., **Ist der moderne Luftverkehr noch vom Wetter abhängig?** [Is modern air traffic still dependent on weather?] *Umschau*, Frankfurt a.M., 52(11):321–324, 1 June **1952.** 4 figs. **DLC**—A general account of the meteorological organization for flying, including observations at an airfield, radiosondes and radarsondes, exchange of weather information by teletype, preparation of weather charts and forecasting, especially terminal forecasts. Route planning is described with examples of 700 mb charts and a semipictorial flight is forecast. The article ends with a word about forecasting for high level (> 30 km.) flights. *Subject Heading:* **1. Airlines meteorological services.**—*C.E.P.B.*

3.11–27 551.5:92

Mill, Hugh Robert, **An autobiography.** With an introduction by L. Dudley Stamp. London, Longmans, Green & Co., **1951.** 224 p. 6 photos. **DLC**—The eight chapters summarize his ancestry and the various interests which made up his life—chemistry, oceanography, geography, rainfall, polar research. Ch. 6, "The distribution of rain," outlines MILL's early climatic observing, relations with A. BUCHAN, G. J. SYMONS, etc., his direction of the British Rainfall Organization 1901–1919, including the introduction of new cartographical methods, and his share in water supply legislation. Ch. 7, "The attraction of the poles," deals extensively with the history of polar, especially Antarctic, exploration. Dr. MILL was born at Thurso, May 28, 1861; died at Dormans Park, April 5, 1950. *Subject Headings:* **1. Biography 2. Mill, Hugh Robert. I. Stamp, L. Dudley.**—*C.E.P.B.*

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

METHODS OF OBSERVATIONS

(*See also items:* 3.11–17, 3.11–48, 3.11–74, 3.11–183, 3.11–207, 3.11–245)

3.11–28 551.501:551.576.4

*Karunik, N. L., **O velichine oshibok pri opredelenii vysoty oblakov vizual'nym sposobom.** [On the magnitude of errors when determining height of clouds by visual means.] *Meteorologiia i Gidrologiia*, No. 1:72–75, Sept. **1950.** 2 tables. **DLC**—An analysis of special observations during January–April 1939 in Moscow. The verification of the height of the clouds was made by pilot balloon observations at 08, 14 and 18h. Total amount of 152 observations were made at the height of stratocumulus, stratus and nimbostratus. The probable error of height of clouds up to 1000 m is estimated as ±100 m (48% of cases) and ±200 m (71% of cases). Of course the pilot balloon observations of cloud height are not always accurate. The greatest error was +695 in the 850–900 m interval, 28 observations were within 30 m of the actual height. *Subject Headings:* **1. Cloud height estimates 2. Observational errors 3. Pilot balloon observations 4. Visual acuity 5. Moscow, U.S.S.R.**—*N.T.Z.*

3.11–29 551.501.1:581.506.8(431/5)

Germany. Deutsche Demokratische Republik, Meteorologischer Dienst, **Anleitung zur Durchführung phänologischer Beobachtungen.** [Instructions for phenological observation.] *Germany. Deutsche Demokratische Republik. Meteorologischer Dienst, Veröffentlichung* No. 5, 1952. 90 p. figs., 33 refs. **DWB**—The purpose and methods of phenological observation are summed up in the brief introduction. A general description and the indication of phenologically significant properties is offered for about 240 plants and about 30 birds, insects and other animals, together with their German and Latin names. Illustrations show many of the plants at various stages of development. The purpose of the booklet is to replace, in improved form, the phenological tables which were used by phenological observers in the German Weather Service before the war and which are no longer available. *Subject Headings:* **1. Phenological observations 2. Instruction for observers 3. Germany.**—*G.T.*

3.11–30 551.501.45:517.512.2

Pollak, Leo Wenzel and Egan, U. N., **Eight-place supplement to harmonic analysis and synthetic schedules for three to one hundred equidistant values of empiric functions.** *Dublin Institute for Advanced Studies. School of Cosmic Physics, Geophysical Memoirs,* No. 1, Pt. 1–2, **1949.** 2 pieces. all tables. 7 refs. **DWB**—Extensive tables, including instructions for use, methods of compilation of tables, accuracy, reliability, etc. Supplements "All term guide for harmonic analysis" (1949) by author. (*See item* 8–11, Aug. 1950, *MAB.*) *Subject Headings:* **1. Harmonic analysis 2. Computation tables.**—*M.R.*

3.11–31 551.501.6:621.396:518

Dickson, David V., **Nomogram and slide-rule for solution of spherical triangle problems found in radio communication.** *Journal of Geophysical Research,* 56(2):163–175, June **1951.** 8 figs., tables, 3 refs. **MH-BH**—For prediction of communication frequencies and other ionospheric measurements which vary with latitude and longitude, a nomogram and slide rule based on NAPIER's proportions has been devised and the theory, data, the nomogram and slide rule and examples of their use are presented. It enables a fix to be made speedily from bearings taken at two points some distance apart. It is especially valuable where a great circle path intersects the edge of a polar gnomonic chart and must be carried across to another gnomonic chart. *Subject Headings:* **1. Nomograms 2. Radio propagation computations 3. Spherical trigonometry 4. Polar gnomonic projections.**—*M.R.*

3.11–32 551.501.7

Kranz, Frederick H. and O'Brien, Robert E., **Construction of a slide rule giving the 10,000 foot level pressure and temperature.** Thesis (*M.S.*)—California Institute of Technology, **1943.** 6 p. diagr. (in pocket), 18 refs. **DWB**—An improvement on the slide rule constructed by FULKS and DIGHTMAN (1941) for calculating upper air pressures from sea level data; the construction of rule, uses and accuracy are discussed briefly and a sample of the rule included. The calculated 10,000 foot pressure has been found to agree with raob data within 5 mb and temperatures within 7°C. The improvement is based on a supplementary scale for determining average lapse rates and consequent 10,000 foot temperatures from air mass and season. Further refinements are necessary to increase accuracy. *Subject Headings:* **1. Slide rules 2. Synoptic analysis.**—*M.R.*

3.11–33 551.501.7

Vujičić, Koviljka, **Rad otseka aerološke klimatologije aerološke opservatorije SUHMS u Beogradu.** [Work of the aerological-climatological department of the aerological observatory SUHMS (Union Management of the Hydrometeorological Service), at Belgrade.] *Yugoslavia. Hidrometeorološka Služba, Hidrometeorološki Glasnik,* 3:97–99, **1950.** In Serbian. **DWB**—The pilot balloon and nephoscope observations made at Yugoslavian stations were checked and tabulated and the aerological characteristics determined. The important problem was the investigation of the dynamics of the air flow over Yugoslavia. However, a shortage of pilot balloons, hydrogen, and experienced observers caused many difficulties. In the summer of 1950 the observatory started photographic observations of the clouds. *Subject Headings:* **1. Aerological observations 2. Yugoslavia.**—*N.T.Z.*

3.11–34 551.501.8:551.556:551.465(449.4

Rouch, J. and Broc, J. (*Musée Océanographique de Monaco*), **Utilisation du radar du Musé Océanographique de Monaco pour des mesures de météorologie nautique.** [Use of radar a the Oceanographic Museum of Monaco for marine meteorological measurements.] *Geofisic Pura e Applicata*, 21:39–40, **1952.** English summary p. 39. **MH-BH**—Since 1949 radar ha been used extensively at the Musée Océanographique in Monaco to study clouds, atmospher vapor, vertical motion and turbulence. Radar echoes from the sea surface taken in conjunctio with other observations facilitate the study of the relationship between wind and state of th sea. *Subject Headings:* **1. Marine meteorology 2. Radar echoes from sea 3. Radar meteo ology 4. Wind waves 5. Ocean-atmosphere interaction 6. Monaco.**—*M.P.K.*

3.11–35 551.501.9(09

Menzl, Oswald, **Das Observatorium auf der Millešovka (früher Donnersberg-Observa torium genannt).** [The Observatory on the Millesovka (formerly called the Donnersber Observatory).] *Zeitschrift für Meteorologie*, 6(1):22–25, Jan. **1952.** List of publication **MH-BH**—A brief history of the activities of the Donnersberg Meteorological Observator which was founded in 1904. A list of the directors and a bibliography of papers which a based wholly or in part upon work carried out at the observatory are given. *Subject Heading* **1. Meteorological observatories 2. Publication lists 3. Donnersberg, Czechoslovakia. M teorologisches Observatorium.**—*I.L.D.*

OBSERVATIONAL DATA

(*See also items:* 3.11–29, 3.11–164, 3.11–199)

3.11–36 551.506:551.58

*Johns Hopkins University. Laboratory of Climatology, Seabrook, N. J., **Micrometeo ology of the surface layer of the atmosphere.** Contract W28-099-ac-378, Interim Report Nos. 13–15, March 31–Sept. 30, **1951.** 3 pieces, figs., tables, equations, foot-refs. (*See ite* 2.6–130, June 1951, *MAB.*) **DWB**—Material of great value not only for research work micrometeorology but also for the solution of a series of general meteorological and hydrologic problems on the interaction between the earth and atmosphere is given. Data on daily valu of maximum and minimum temperature, precipitation, computed and observed evapotran piration are presented. Hourly mean values of wind velocity, solar and net radiation we obtained. Hourly profiles of air temperature, soil temperature and wind velocity are give for twenty-six 24-hour periods. For 52 Seabrook stations the temperature and precipitatio for each day is given. Observations of shear stress on a lake surface were made. Report N 15 contains single articles on different subjects, which are abstracted separately. *Subje Headings:* **1. Observational data 2. Micrometeorology 3. Evapotranspiration 4. She stresses 5. Seabrook, N. J. I. Thornthwaite, Charles Warren II. Halstead, Maurice H III. Mather, John R. IV. Portman, Donald J. V. McFarland, A. VI. Floyd, P. M VII. Contract W28-099-ac-378.**—*A.A.*

3.11–37 551.506:551.584

*Johns Hopkins University. Laboratory of Climatology, Seabrook, N. J., **Micrometeo ology of the surface layer of the atmosphere.** Contract W28-099-ac-378, Interim Report N 16, Dec. 31, **1951.** 92 p. 8 figs., mostly tables, 5 refs. **DWB**—Microclimatic data on tem perature, humidity and wind are included. Description of a portable dew point indicator given. This report contains also two single articles on evapotranspiration, which are to b abstracted separately. *Subject Headings:* **1. Micrometeorological data 2. Evapotranspiratio 3. Dew point recorders 4. Seabrook, N. J. I. Thornthwaite, Charles Warren II. Halstea Maurice H. III. Osborn, Robert R. IV. Contract W28-099-ac-378.**—*A.A.*

3.11–38 551.506.1(71

*Canada. Meteorological Division, **Monthly meteorological summary of Toronto Ontario for January 1944–December 1949.** 1 piece. all tables. **DLC**—In addition to usua daily or 4 times daily values of meteorological elements, hourly wind direction and velocity

dry bulb and mixing ratio are tabulated. Comparative data are given for each year during the decade (and since 1841 in the annual summaries). Daily snowfall, precipitation, maximum, minimum and mean temperature and seasonal degree days (1930 to date) are also given in its annual summaries. Contents vary. All observations are made at the Central Observatory at 315 Bloor St., Toronto (semiresidential area). *Subject Headings:* **1. Monthly summaries 2. Observational data 3. Toronto, Ontario.**—*M.R.*

3.11–39 551.506.1(417)

*Dublin Institute for Advanced Studies. School of Cosmic Physics, **Meteorological bulletin for Dublin City** [for] **Dec. 1951.** 14 p. Mimeographed. **DWB**—A monthly bulletin, giving detailed data on pressure, temperature, relative humidity, wind, cloud amount and type, precipitation, sunshine, maximum wind, earth temperature at 1 and 4 ft for fixed observations (1 to 3 a day), and rainfall, sunshine and solar radiation (total, maximum and minimum) for each hour of the day. *Subject Headings:* **1. Observational data 2. Monthly weather reports 3. Solar radiation data 4. Dublin, Ireland.**—*M.R.*

3.11–40 551.506.1(415/9)

*Eire. Meteorological Service, **Monthly weather report. Summary for the year 1950, Pts. I–IV.** Dublin, **1951.** 4 pieces. mostly tables. **DWB**—Pt I of this annual summary contains text, charts and data on temperature, sunshine, rainfall, pressure, humidity, cloudiness, wind, maximum gusts, and station location chart for all of Eire. Pt II gives more detailed data for the rainfall network, arranged by counties; also percent of normal (1881–1915) for selected stations, number of days with hail and thunderstorms for a score of stations. Pt III gives hourly values of meteorological elements for Dublin Airport, Valentia Observatory, Claremorris and Mullingar, Midleton and Shannon airports, with details of exposures and conversion factors. Pt IV gives aeronautical data (visibility, ceiling, cloud amount and wind, and combinations thereof when occurring simultaneously. Also frequency of various hydrometeors, for Shannon and Dublin airports, respectively. *Subject Headings:* **1. Annual reports 2. Aeronautical climatology 3. Climate of Ireland 4. Shannon Airport, Ireland 5. Dublin Airport, Ireland 6. Ireland.**—*M.R.*

3.11–41 551.506.1(46)

*Spain. Servicio Meteorólogico Nacional, **Boletín Mensual Climatológico.** [Monthly Climatological Bulletin.] v. 5, **1944**– v. 13(3), March **1952.** charts, diagrs., tables. **DWB** – Publication of this monthly bulletin began in 1940. The text gives a brief day to day summary of the weather for the country and a summary of meteorological observations taken at the observatory at Madrid. Data are presented in tables for the following: 1) surface wind direction (from 8 directions) and force; 2) pressure, humidity, insolation and various phenomena (shown by code); 3) mean, maximum and minimum temperature; 4) days with rain and snow, total precipitation and maximum in 24 hours; 5) storms; 6) aeronautical climatology—cloud types (1–10), heights of base of highest clouds, horizontal visibility, surface wind at 12 noon (from 8 directions) and 7) direction and velocity of upper air wind. Dates of seeding or planting, flowering, ripening and harvesting of various crops at different phenological stations are included. Daily observations of pressure, temperature, insolation, cloudiness, humidity and wind directions and velocity at Madrid are shown diagrammatically. Wind roses for a number of stations are shown on a map. *Subject Headings:* **1. Climatic data 2. Monthly summaries 3. Spain.**—*M.L.R.*

3.11–42 551.506.3:551.577.2./3(689)

*Southern Rhodesia. Meteorological Dept., **Rainfall handbook.** Pub. by the Govt. Jan. **1951.** 30+p. tables, charts, graphs, refs. **Supplement No. 1, Jan. 1951.** 55 p. tables. **DWB**—Brief historical review of precipitation records in Southern Rhodesia (beginning in 1890). Regular official meteorological observations began in April 1897 at Bulawayo and Salisbury and were published regularly in the Annual Report of the B.S.A. Co. on the administration of Rhodesia from 1896/97 to 1939/40. A summary was published by FATHER E. GOETZ in 1909 (*Rhodesia Scientific Assoc. Proceedings* 8(3), 1909). Record for 1200 stations (of which 850 are reporting currently) are available. Included in this excellent report are

elaborate statistical presentations of average, daily (for year) precipitation, frequency dist
bution, means, medians, etc. for selected stations, as well as tabular data and discussic
Persistence of wet and dry periods is studied and contingency tables presented for 6 statio
Long period changes, standard deviations of rainfall from mean for area, variation over great
distances and other statistical analyses are made. A list of 312 stations, with location
large fold-in map, name of observer, etc., is included. A colored isohyetal chart of the area
also included. Most of the analyses are grouped by sub-regions to make the study mc
significant. In the supplement (No. 1) the monthly and annual totals for the entire peri
of record for each of about 100 stations is given. *Subject Headings:* **1. Meteorological servic
2. Rainfall data 3. Rainfall variations 4. Southern Rhodesia.**—*M.R.*

3.11–43 551.506.3551.582.1(68

*Southern Rhodesia. Meteorological Dept., **Climatological summaries, Northern Rh
desia, July 1938/June 1948.** [1948?] *Idem*, **Northern Rhodesia and Nyasaland, Ju
1948/June 1949.** [1949?] *Idem*, **Southern Rhodesia, July 1948/June 1949.** [1949
Entirely tables. **DWB**—In 1938 the Southern Rhodesia Meteorological Dept. took over t
responsibility for meteorological service in Northern Rhodesia from the British East Afric
Service. Ten years of record are presented to be used as normals until longer records a
available. Data for nine stations with trained observers and 21 stations with part tir
observers are tabulated. Annual values (1938–1947) as well as averages are given for the e
tire network, and more extensive tables for the 1st order than for 2nd order stations. Suppl
ments give summaries of data for July 1948–June 1949 for 34 stations in Northern Rhodesi
24 in Nyasaland and 51 stations in Southern Rhodesia. Location of all stations, with latitud
longitude and altitude, are given in alphabetical table. *Subject Headings:* **1. Climatic da
2. Northern Rhodesia 3. Southern Rhodesia 4. Nyasaland. I. Nyasaland. Meteorologic
Service II. Northern Rhodesia. Meteorological Service.**—*M.R.*

3.11–44 551.506.5:551.510.52:551.557.3(9

Liljequist, Gösta, **Den norsk-brittisk-svenska antarktisexpeditionen 1949–52. E
översikt av färder och arbeten intill mitten av december.** [The Norwegian-British-Swedi
Expedition of 1949–52 to the Antarctic. A survey of expeditions and work up until the mid
of Dec.] *Ymer*, Stockholm, 71(2):81–113, **1951.** photos, tables. In Swedish, Engli
summary p. 112–113. **DWB**—The personnel, equipment, plans of the quarters and la
oratories, as well as the main findings of the meteorological investigations are contained in t
overall report of the expedition. A weakly defined tropopause was identified in the winter a
a sharply defined tropopause in summer. Winds aloft were usually strong and turbulent, a
from W or WSW in the upper troposphere, but S or E in the lower layers. The camp w
located at 71°S and 11°W. Excellent photographs of various phases of the expedition a
included. *Subject Headings:* **1. Antarctic expeditions 2. Tropopause 3. Upper air win
4. Norwegian-British-Swedish Expedition 5. Antarctica.**—*M.R.*

3.11–45 551.506.7:551.508.822(49

*Belgium. Institut Royal Météorologique, **Observations aérologiques de la Station c
Radiosondage d'Uccle. Température et humidité relative de l'air aux pressions standard
1945–1950.** [Aerological observations of the Uccle radiosonde station. Temperature ar
relative humidity of the air at standard pressure levels, 1945–1950.] Brussels, **1945–195**
tables. In French and Dutch. *Idem*, **Observations aérologiques de la Station d'Uccl
1946–1948.** tables. In French and Dutch. Quarterly. **DWB**—During 1946–48 the actu
height, pressure, temperature and humidity for each significant and standard level we
published in quarterly issues for each of one, and later two, radiosonde ascents a day. T
1949 and 1950 issues consist of monthly tabulations of observations made for each hour (0
and 15h at first and 03, 09, 15 and 21h since May 1950) during each day of each month, ar
monthly summaries of temperature and humidity for each standard level (*see item* 2.1–25
Jan. 1951, *MAB*). *Subject Headings:* **1. Upper air data 2. Radiosonde data 3. Annu
reports 4. Uccle, Belgium.**—*M.R.*

3.11–46 551.506.7(471.

*Finland. Ilmatieteellin en Keskuslaitos, **Aerologiset Havainnot. Die Aerologischen Be
bachtungen in den Jahren 1944–1947.** [Aerological observations, 1944–1947.] *Finlan*

Ilmatieteelin en Keskuslaitos. Suomen Meteorologinen Vuosikirja, v. 44/45–46/47, Pt. 3, 1944–1947. pub. **1951.** 147+97 p. 2 pieces. entirely tables, refs. In Finnish and German. **DWB**—Data sources were the central meteorological institution for Finland and the defense authority. Tables show the heights of the different isobaric surfaces and the temperature and relative humidity at each level for various radiosonde stations. Number and average height of ascents during different months are recorded. Upper air wind velocity observations were made with radiosondes and pibals. The numbers of wind observations by months are included. *Subject Headings:* **1. Upper air wind data 2. Radiosonde data 3. Finland. I. Rossi, Veikko,** (*ed.*).—*M.P.K.*

3.11–47 551.506.7(471.1)

*Finland. Ilmatieteellin en Keskuslaitos, **Aerologiset Havainnot Suomessa, Januar 1952.** [Aerological observations for January 1952 made in Finland.] Helsinki, pub. by the author. First issue, Jan. 1952, pub. Mar. 10, **1952.** entirely data. In Finnish and Swedish. **DWB**—Results of twice-daily radiosonde observations made at two stations in Finland (Ilmala 60°N and Sodankyla 67°N) in Jan. 1952 according to temperature and Pilot Code. Wind aloft observations were made by following radiosonde balloon with theodolite. No summary is provided, but observations are checked before being published after end of each month. *Subject Headings:* **1. Radiosonde data 2. Upper air wind data 3. Monthly bulletins 4. Finland.**—*M.R.*

3.11–48 551.506.7:551.501.7(261, 492)

*Netherlands. (K.) Meteorologisch Instituut, **Upper air data and special synoptic observations,** 1945/46, 1947–48. *Netherlands. (K.) Meteorologisch Instituut*, No. 106A, v. 30/31, 32-33, 1945/46, 1947–48, **1951.** 3 pieces. entirely tables. In English. **DWB**—Radiosonde data are given for standard pressure surfaces, significant points and geopotential heights for De Bilt, Holland and since 1948 for the Atlantic Weather Ship Cirrus (station K) assigned to the Netherlands Service. The new series is a continuation of the *Ergebnisse Aerologischer Beobachtungen*, which ceased with No. 29 (1940). No upper air observations were made between May 13, 1940 and June 1, 1945, when pilot balloon observations were resumed and Oct. 16, 1945 when radiosonde observations were resumed. The work has been under the supervision of PROF. W. BLEEKER. *Subject Headings:* **1. Upper air wind observations 2. Radiosonde data 3. Marine meteorological data 4. Weather Ship "Cirrus," Atlantic Ocean 5. De Bilt, Netherlands. I. Bleeker, W.**—*M.R.*

INSTRUMENTS AND INSTRUMENT CARRIERS

(*See also items:* 3.11–14, 3.11–45, 3.11–60, 3.11–61, 3.11–106, 3.11–182, 3.11–197)

3.11–49 551.507.321.2

Molded Latex Products, Inc., Paterson, N. J., **High altitude balloon research and development.** Contract DA-36-039-sc-4, Quarterly Reports Nos. 3, 4, and 7, April 30, July, **1950** and April 30, **1951.** 3 pieces. tables. **DWB**– The purpose of the research reported in these papers is "to investigate the feasibility of providing a neoprene balloon which will carry a 5 lb pay load to an altitude of 150,000 ft during daytime and during all seasons of the year." Reports 3 and 4 contain information on patch test and flight results for 10,000 and 500 g balloons made of fresh American Anode Compound 120–407. Experiments made with 3000 g GJ-compound balloons are described in report 7 and flight and pull results tabulated. *Subject Headings:* **1. Balloon research 2. High altitude balloons. I. Dickson, John A. II. Dean, Donald A. III. Nelson, Eric IV. Contract DA-36-039-sc-4.**—*G.T.*

3.11–50 551.507.362:551.510.53

*Michigan. University. Engineering Research Institute, **Upper air research program.** Contract W-33-038-ac-14050, Report no. 2, July 1, **1948.** 205 p. photos., graphs, diagrs., refs. **DWB**—This comprehensive report gives pressure values obtained from ionization and Pirani gages attached to V-2 rockets fired at White Sands, N. M., in 1946 and 1947, temperature values obtained on 3 rocket flights (presented in numerous graphs); the details of

instrumentation and wiring, theory of operation of equipment and of ambient conditions the atmosphere up to 120 km, and comparison of readings with NACA standard atmosphe data (also shown graphically). Effects of rotation, of slipping back tail first at top of flig of ascent and descent and comments on unsuccessful flights, and improvements expected future flights are also discussed. *Subject Headings:* **1. Rocket data 2. Rocket instrumentati 3. Temperature of the stratosphere 4. Stratospheric pressure 5. White Sands, N. I I. Schultz, F. V. II. Spencer, N. W. III. Reifman, A. IV. Contract W-33-038-ac-14050.** *M.R.*

3.11–51 551.508:551.5

Brooks, F. A. and Kelly, C. F., **Instrumentation for recording microclimatological facto** *American Geophysical Union, Transactions*, 32(6):833–846, Dec. **1951.** 4 figs., 6 tables, re Discussion by SCHULTZ, HERBERT B., p. 846–848, fig., table, refs. **MH-BH**—A scheme f classifying weather types for continental U. S. is outlined; it depends upon air mass and clou cover. The meteorological variables involved in the heat exchange between plants and anima and their surroundings are given. The special instruments developed for measuring heat flo (globe thermometers) and capillary evaporation (Livingston atmometer), a portable micr weather station for describing climate at level of plants and animals, and the recording p tentiometer which makes possible hourly recording of all regular weather observations a described. An example of the estimation of the heat balance between sky and ground radiati at El Centro, California, is presented. *Subject Headings:* **1. Microclimatological instrument tion 2. El Centro, California. I. Schultz, Herbert B.**—*I.L.D.*

3.11–52 551.508.53

Conover, John H., **A new combination anemometer, wind vane and wind direction record for Mt. Washington Observatory.** *American Meteorological Society, Bulletin*, 32(10):386–39 Dec. **1951.** 8 figs. **MH-BH**—A description of the design and construction of a combinati anemograph that consists of a standard heated aircraft pitot tube attached to a heated van the vane's movement is recorded by means of selsyn motors. A photograph of the heat anemometer and wind vane, a schematic diagram of the wind vane anemometer, mast, ar selsyn transmitter, a wiring diagram of the wind vane anemometer heaters and a schemat diagram of the wind speed recorder are given. The behavior of the apparatus in actual tes is discussed. *Subject Headings:* **1. Anemometers 2. Heated anemometers 3. Mt. Was ington Observatory.**—*I.L.D.*

3.11–53 551.508.53

West, George (*San Carlos, Calif.*), **Wind recorder for microclimatology.** *Electronic* Albany, N. Y., 25(6):136–138, June **1952.** 4 figs., 4 refs. **DLC**—A portable, sensitive, rap response electronic wind velocity recording system is described and illustrated. Details operation and calibration of the separate units and the integrated system (which is mo accurate than the individual parts) are discussed and wiring diagrams shown. A "keep-alive circuit produces a constant but imperceptible vibration of the pen arm to reduce lag in respon to small fluctuations in wind. The equipment is easily standardized in the field. Windspee accuracy is $\pm 5\%$ and direction $\pm 3°$ azimuth, and the lower threshold for speed and directi is <1 mph. The use of phototube control, rather than the usual mechanical contacts anemometer or wind vane circuits, results in longer life and quicker response. *Subject Hea ings:* **1. Wind recorders 2. Electronic recorders 3. Micrometeorological instruments.**—*M.*

3.11–54 551.508.59:551.5

Frankenberger, Ernst, **Grundlagen zur Messung von Strömen des atmosphärische Vertikalaustausches.** [Bases for measuring currents in atmospheric vertical exchange. *Germany. Deutscher Wetterdienst in der US-Zone, Berichte* No. 35:133–135, **1952.** fig. **MH BH**—Methods of measuring vertical exchange by combined turbulence and convection a discussed and the characteristics of a proposed Austausch-measurer deduced. *Subject Headin* **1. Turbulence measurement.**—*C.E.P.B.*

3.11–55 551.508.71

Dew-point hygrometer. *Instruments*, Pittsburgh, 25(5):566, May 1952. fig. **MH-BH**—A new "electronic dew point hygrometer" manufactured by Barton, Los Angeles, is introduced in a brief note and shown in a photo. The operation of the instrument is based on a polished metal mirror which is maintained at dew point temperature by an automatic control system. The instrument continuously indicates dew point temperature in regard to any component of gas or several components (for this latter purpose a train of instruments must be used). It is claimed "to provide a primary laboratory standard for measurement of isobaric condensation temperature." *Subject Headings:* **1. Dew point hygrometers 2. Electronic dew point instruments.**—*G.T.*

3.11–56 551.508.71

Hadady, R. E. (*American Instrument Co., Inc.*), **Moisture measurement.** *Instruments*, Pittsburgh, 25(5):600–602, May 1952. 5 figs., table. **MH-BH**—Various methods of moisture measurement, such as gravimetric, dew point, wet and dry bulb, mechanical measurement and measurement through electrical resistance, absorption, thermal conductivity, the galvanic system and liberation of gas, are reviewed and the characteristics of some of them listed in a table which indicates principle of the system, operating or dew point range, accuracy, error at 72°F and 50% R.H., operating temperature range, response speed, simplicity of operation and approximate price. A General Electric and an Alnor dew point apparatus, an Aminco and a mechanical system hygrometer are shown in photos. *Subject Headings:* **1. Humidity measurement 2. Hygrometers 3. Dew point recorders 4. Psychrometers.**—*G.T.*

3.11–57 551.508.71:551.508.822:551.571.7(44)

Raout, L. (*Trappes, France*), **Remarques sur la répartition de l'humidité en altitude.** [Remarks on the distribution of humidity aloft.] *Journal Scientifique de la Météorologie*, Paris, 3(11):107–111, July–Sept., 1951. 2 figs. **DWB**—Since the dew point hygrometer is relatively bulky, gold-beater's skin hygrometers have been used in an attempt to attain greater accuracy from radiosonde observations of humidity in the stratosphere. Soundings made at Trappes from March to June 1951 show that the results are qualitatively accurate (the curves show good response to entry of clouds and inversion layers, and the descent curve parallels the ascent curve), but the magnitude of the errors due to slow response at low temperatures is too great to allow the use of this hygrometer for quantitative measurements. Qualitative indications of humidity increases in the stratosphere are of particular interest and of some value. *Subject Headings:* **1. Radiosonde hygrometers 2. Hygrometers 3. Radiosonde accuracy 4. Upper air humidity 5. Trappes, France.**—*M.R.*

3.11–58 551.508.71

Steiger, Walter R., **A new development in the measurement of high relative humidities.** *Science*, Wash., D. C., 114(2954):152–153, Aug. 10, 1951. graphs. **DLC**—Attention is drawn to the inadequacy of most standard hygrometric instruments for measuring relative humidities approaching 100% or undertaking measurements in remote and confined places. An electric hygrometer consisting of a coil wound with platinum wire and coated with lithium chloride and polyvinyl alcohol is described as not being subject to those shortcomings, owing to its small dimensions and the fact that its sensitivity approximately doubles between 95–100% relative humidity. The free energy of soil moisture can be measured with this instrument through measurement of the relative humidity of the air in soil, thus excluding the interference of soluble salts. Two calibration curves are presented. *Subject Headings:* **1. Soil hygrometers 2. Electric hygrometers.**—*G.T.*

3.11–59 551.508.71

Treloar, L. R. G., **The absorption of water by hair, and its dependence on applied stress.** *Faraday Society, Transactions*, London, Part 6, 48(354):567–576, June 1952. 9 figs., 7 refs. **DLC**—It has been reported by White and Stam that the equilibrium water content of human hair is decreased by the application of a tensile stress. This result is shown to be inconsistent with general thermodynamics, which predicts an opposite effect in the case when liquid absorption is accompanied by longitudinal extension, as it is in hair. Experiments with horsehair,

in which the water content in the stressed and unstressed states, at 75.5% relative humidit was determined by weighing, showed a small increase in water content on applying a tensi stress, the effect amounting to 0.28% on the dry weight for a stress of 482 kg–cm². Th increase was in quantitative agreement with the thermodynamic theory. Subsidiary measur ments of dimensional changes accompanying the application of tension indicated a sma increase of volume of the amount to be expected from theoretical considerations. Data a also presented for the length changes which accompany water absorption, and for the wat absorption as a function of relative humidity. Curves are included for the theoretical increa of water content with longitudinal tensile stress over the whole range of humidity, and for t theoretical decrease in water content under lateral compressive stress. The latter effect ma be as much as 200 times the former, on account of the anisotropy of swelling. *Subject Hea ings:* **1. Hair hygrometers 2. Water absorption by hair.** *Author's abstract.*

3.11–60 551.508.765:551.507.35

Jensen, Clayton E. (*MIT, Cambridge*), **Airborne recorder for liquid water content measu ing instrument.** Thesis (*M.Sc.*)—M.I.T. (In: Massachusettsl nstitute of Technology, Dep of Meteorology, **A recorder for an airborne liquid water content measuring instrument.** Co tract DA-36-039-sc-124, Technical Report No. 16, July 15, **1951.** 29+p. 7 diagrs., graphs, refs.) **DWB**—Instruments for measuring the water content of clouds in flight were develope by M.I.T. in 1944 and called capillary collectors. This paper describes equipment devised record continually and automatically the water collected and avoid manual reading an setting, as was necessary heretofore. The theory and operation of the capillary collecto previous designs of automatic recorders, the transducer recorder and its calibration, erro (due to varying atmospheric salt concentrations and water temperature and pressure), an computation of records are treated. Suggestions for improvements are also made. Actua records, nomograms and line drawings are appended. *Subject Headings:* **1. Liquid wate content of clouds 2. Capillary collectors 3. Cloud physics instruments. I. Massachusett Institute of Technology. Dept. of Meteorology II. Contract DA-36-039-sc-124.**—*M.R.*

3.11–61 551.508.765:551.507.35

Massachusetts Institute of Technology. Dept. of Meteorology, **A recorder for an ai borne liquid water content measuring instrument.** Contract DA-36-039-sc-124, Technic Report No. 16, July 15, **1951.** 30+p. Pt. 1, Jensen, Clayton E., **Airborne recorder for liqui water content measuring instrument.** Thesis (*M.Sc.*)—M.I.T.; Pt. 2, Bemis, Alan C. an Cunningham, Robert M., **Evaluation of the recording capillary collector.** 7 figs., 11 ref **DWB**—For contents of Pt. I *see* 3.11 60 above.—In the second part Bemis and Cunningha criticize the liquid water content recorder of Jensen, and the conclusion is that it has no proved satisfactory (in spite of previous opinions to the contrary) and will be very useful unde most flight conditions (where snow or ice are not present) and is rugged, sensitive and de pendable. *Subject Headings:* **1. Liquid water content of clouds 2. Capillary collectors 3. Clou physics instruments. I. Jensen, Clayton E. II. Bemis, Alan C. III. Cunningham, Robert M IV. Contract DA-36-039-sc-124.**—*M.R.*

3.11–62 551.508.765:551.574.1:551.508.8

Cooper, B. F. (*Sydney, Australia*), **Balloon borne instrument for telemetering raindrop size distribution and rainwater content of clouds.** *Australian Journal of Applied Science* 2(1):43-55, **1951.** diagr., graphs, photos., refs. Abstracted from reprint. **DWB**—A instrument is described and illustrated which gives quantitative information on raindrop siz and water content per unit volume of cloud. The device is carried by a radiosonde typ balloon and the data are transmitted to the ground by radio. The force of impact of a drop o the microphone at the transmitter indicates size of drop; the frequency of impulses gives th count, and the impulses received are sorted automatically into amplitude groups to give th drop size distribution. A check on total liquid water content is obtained by a separate catchin funnel which allows drops of uniform and known size to fall on a similar microphone, thu integrating along with the larger drops the water caught from drops of <.5 mm diameter whic cannot usually be detected due to static. Besides data on construction, circuits, calibratio and accuracy, actual records are given. *Subject Headings:* **1. Raindrop size distribution meter**

2. Drop size meters 3. Liquid water content of clouds 4. Radiosondes 5. Cloud physics.—*M.R.*

3.11–63 551.508.765:551.574.1

Instruments for cloud research. *Engineering*, London, 171(4435):96, Jan. 26, **1951. DLC**—Description of rotating disk icing meter which is nearly 100% efficient in collecting drops of any size encountered on flights of the Rockcliffe aircraft. The ice formed in 10 seconds on a rotating blade is scraped off after being measured for thickness by a feeler. The National Research Council of Canada developed another instrument for measuring liquid water content of a cloud with high water content or of an ice crystal cloud, a camera for measuring size of cloud droplets and an improved thermometer for use on planes in icing conditions; these are described. *Subject Headings:* **1. Icing meters 2. Liquid water content of clouds 3. Cloud physics 4. Drop size measurement. I. Canada. National Research Council.**—*M.R.*

3.11–64 551.508.765:551.576.11:551.507.352

Levine, Joseph and Kleinknecht, Kenneth S., **Adaptation of a cascade impactor to flight measurement of droplet size in clouds.** *U. S. NACA, Research Memorandum*, E51G05, Sept. 18, **1951.** 28 p. photos., diagrs., graphs, eqs., refs. **DWB** -Report on experiments made at the NACA Lewis Laboratory with a cascade impactor for obtaining the size distribution of droplets. The drops are collected on four slides coated with magnesium oxide to prevent evaporation of the droplet after impingement. By building a diffuser around the instrument it was adapted for cloud droplet size studies for an airplane traveling at about 100 mph. Cross sections and photos are given of impactor and diffuser and their installations as well as photomicrographs of slides exposed in the impactor. Data from two flights are presented. In the appendix the theoretical trajectories of droplets are computed. *Subject Headings:* **1. Drop size distribution measurement 2. Air-borne instruments. I. U. S. NACA.** —*G.T.*

3.11–65 551.508.765

Squires, P. and Gillespie, C. A., **A cloud-droplet sampler for use on aircraft.** *Royal Meteorological Society, Quarterly Journal*, 78(337):387–393, July **1952.** 4 figs., 9 refs. **DWB**—A glass rod of 3 mm diameter and 25 cm long coated with magnesium oxide is shot out by a spring and withdrawn in 1/30 sec. A magazine carries 10 rods and can be reloaded in 40 50 sec. Collection efficiency, calibration and interpretation discussed and some specimen histograms from a cumulus given. Calculated liquid water content less than adiabatic value. *Subject Heading:* **1. Drop size meters.**—*C.E.P.B.*

3.11–66 551.508.79:551.574.7:656.7

Perkins, Porter J.; McCullough, Stuart and Lewis, Ralph D., **A simplified instrument for recording and indicating frequency and intensity of icing conditions encountered in flight.** *U. S. NACA, Research Memorandum*, E51E16, July **1951.** 26 p. diagrs., photos., graphs, refs. **DWB**—Report on an instrument based on the difference between an ice-free total-pressure system and another one in which small holes are allowed to plug with ice accretion. The unit, which weighs only 18 lbs, is described as being suited for automatic operation and as producing photographic recordings of icing rate, airspeed and altitude, in addition to visual indications for the pilot. Recorded values of icing rate and airspeed are declared to provide a means of obtaining values of cloud liquid water content. Diagrams and photos of equipment and graphs for calculating various values are presented. *Subject Headings:* **1. Icing of aircraft 2. Ice accretion 3. Icing meters.**—*G.T.*

3.11–67 551.508.85:551.578.41:551.574.1

§Marshall, J. S. and Gunn, K. L. S., **Measurement of snow parameters by microwave.** McGill University. Macdonald Physics Laboratory, Contract AF19(122)-217, Research Project MW-2, May **1951.** 28 p. charts, graphs, refs. **DWB**—The authors have analyzed radar observations made by LANGILLE (1951) on falling snow at Ottawa, showing a good correlation between Z (the sum of the 6th powers of the diameter) and R (snowfall), and evidence that equal precipitation rates, whether rain or snow, give equal values of Z. Relation to

mechanism of melting region is considered; the determination of size distribution from Z and R is discussed and shown graphically, and synoptic charts and a discussion of relation of weather to size distribution given for several situations. *Subject Headings:* **1. Radar analysis of precipitation 2. Snow echoes 3. Drop size distribution 4. Ottawa, Canada. I. McGill University. Macdonald Physics Laboratory II. Contract AF19(122)-217.**—*M.R.*

3.11–68 551.508.91

Pollak, Leo Wenzel (*Dir. School of Cosmic Physics, Dublin Inst. for Adv. Studies*), **A condensation nuclei counter with photographic recording.** *Geofisica Pura e Applicata*, Milan, 22(1/2):75–83, Jan./Mar. **1952.** 4 figs., 7 refs. English and German summaries p. 75. **MH–BH**—An elaborate and improved combination visual and photographic nuclei counter is described and illustrated. The 24-square grating allows a much more rapid counting than was possible with the Aitken instrument. Further advantages are: 1) possibility of elimination of repeated sampling to get a good average, 2) leaks are prevented by special sealing arrangement and by vacuum tops, 3) windows can be electrically heated to remove condensation, 4) a magnetic stirrer and 2 detachable pumps are provided and 5) range of drop density possible from 1 drop per 24 mm^2 to 350,000 per cm^3 (visual) or 3 million per cm^3 (photographically). Aitken counter ranges from 55 to 140,000 per cm^3. Records are reproduced. *Subject Headings:* **1. Nuclei counters 2. Condensation nuclei.**—*M.R.*

SYNOPTIC ANALYSIS AND FORECASTING

(*See also items:* 3.11–12, 3.11–14, 3.11–193, 3.11–222, 3.11–235)

3.11–69 551.509.3

Baur, Franz, **Die gegenwärtige Krise in der synoptischen Meteorologie.** [The present crisis in synoptic meteorology.] *Naturwissenschaftliche Rundschau*, Stuttgart, 5(8):313–317, Aug. **1952.** 14 refs. **DWB**—After a brief history of synoptic meteorology author doubts whether the present costly organization has improved weather forecasts. He then discusses the possibility of improvement by the application of electronic calculators to mathematical dynamic meteorology, but concludes that the problem is too complex. Finally, he advocates the use of multiple correlation and selective frequency tables. This can give successful 36 hour forecasts from surface data at a few representative stations and also monthly and seasonal forecasts, but much preparatory work is required. *Subject Heading:* **1. Forecasting techniques.** —*C.E.P.B.*

3.11–70 551.509.3:551.515.7

Brezowsky, Helmuth, **Bemerkungen zur Antizyklogenese.** [Remarks on anticyclogenesis.] *Annalen der Meteorologie*, 4(7/9):330–335, **1951.** 5 figs., 5 refs. German and English summaries p. 330. **DWB**—Six anticyclones in 1948 (*see item* 2.6–30, June 1951, *MAB*) are reexamined. Each developed by convergence between cold air current on E flank of a primary warm sector, and a SW warm current. Developments are illustrated by relative topography 500–1000 mb. A few qualitative types are distinguished from statistical data and permit medium range forecasting along one of three lines. *Subject Headings:* **1. Anticyclones 2. Extended forecasting.**—*C.E.P.B.*

3.11–71 551.509.31:656.7(02)(71)

Canada. Meteorological Division, **Manair; manual of standard procedures for meteorological service to domestic aviation, effective Oct. 1, 1951.** 2nd ed. *Canada. Meteorological Division, Cir.* 1988, *Air-73*, Aug. 1, **1951.** 192 p. maps. **DWB**—A comprehensive and detailed manual which outlines the standard procedures and practices promulgated by the Canadian Meteorological Division for providing meteorological service to domestic aviation (both private and scheduled) and also to military aviation. Service for jets is not yet completely formulated but it is evident that increased speed, range and height increase, rather than decrease, need for meteorological service of a specialized type, and for more emphasis on forecasts rather than reports. The main administrative and detailed regional organization of the aviation service, verification of forecasts, map analyses, route and flight forecasts, briefing,

aircraft observations, familiarization flights, etc. are outlined. *Subject Headings:* **1. Aviation meteorological services 2. Airways forecasting 3. Manuals 4. Forecasting techniques 5. Canada.**—*M.R.*

3.11–72 551.509.31:551.588.1:551.46(262)

Jansá Guardiola, José Maria, **Previsión del tiempo en el Mediterráneo occidental.** [Weather forecasting in the western Mediterranean.] *Revista de Geofisica*, Madrid, 10(39): 234–235, July-Sept. 1951. **DWB**—A substantial, illustrated treatise on the geographic, climatological and synoptic conditions which affect the success or failure of forecasts in the western Mediterranean, and especially in Spain. The remarkable feature of this region is the large expanse of warm sea surrounded on every side by high mountains. Invasions of air must come through the gaps in a manner similar to military invasions. These "channels" are listed and described. Oceanographic conditions of the Mediterranean are then described (depth, currents, tides, waves, salinity, transparency, color and temperature) and, finally, the soil and vegetation conditions are described briefly. *Subject Headings:* **1. Synoptic forecasting 2. Oceanography 3. Mediterranean Area.**—*M.R.*

3.11–73 551.509.31(47)

KHromov, S. P., **K peresmotru osnovnykh poniatiĭ sinopticheskogo analiza.** [A review of the basic concepts of synoptic analysis.] *Meteorologiia i Gidrologiia*, No. 2:20–26, Oct. 1950. Zubian, G.D., **Po povodu stat'i S. P. KHromova "K peresmotru osnovnykh poniatiĭ sinopticheskogo analiza."** [A critical review of the article by S. P. KHromov, "A review of the basic concepts of synoptic analysis."] *Ibid.*, p. 27–33. **DLC**—KHROMOV approves the attempt to establish a connection between frontological concepts and advective—dynamic forms of synoptic analysis. This connection, however, is insufficiently defined, which is why further investigations were needed. Some of the author's conclusions are not new or not entirely correct. His definition of differences between warm and cold air masses by means of baric topography can be applied in synoptic analysis. The review published in 1948 by KH. P. POGOSIAN and N. L. TABOROVSKIĬ contains many new and important results for work in synoptic analysis which indicate that opinions stated in KHROMOV's review are incorrect. The main content of this review is the criticism of unimportant questions but KHROMOV paid no attention to important conclusions developed by POGOSIAN and TABOROVSKIĬ, for instance—the kinematics and dynamics of frontogenesis in the troposphere, the dynamic variations of air pressure, the analysis of frontal zones in connection with thermobaric fields and many others. *Subject Headings:* **1. Synoptic analysis 2. Frontal analysis 3. Frontolysis 4. U.S.S.R. I. Zubian, G. D. II. Pogosian, KH. P. III. Taborovskiĭ, N. L.**—*N.T.Z.*

3.11–74 551.509.317:551.515.8:551.501(02)(52)

Weston, Andrew W., **The technique of lapse-rate analysis.** [1951?] 53 p. graphs. Mimeographed. **DWB**—A practical method of plotting upper wind data alongside raob data (lapse rates of temperature and humidity) and of analyzing these data in terms of frontal surfaces, subsidence discontinuities, convective layers and discontinuities, radiation inversions, etc. is described and illustrated in this manual prepared for use in Air Weather Service refresher courses in Japan. A method of determining relative humidity by means of a plexiglass scale and of determining convective instability is developed. *Subject Headings:* **1. Upper air analysis 2. Synoptic analysis 3. Nomograms 4. Manuals. I. U. S. Air Force.**—*M.R.*

3.11–75 551.509.33:551.590.21

Bean, Louis H., **Extrapolation of sunspot-climate relationships.** *Journal of Meteorology* 9(1):76:78, Feb. **1952.** 3 tables, ref. Reply by HURD C. WILLETT. **MH-BH**—(*See item* 2.8–42, Aug. 1951, *MAB.*) BEAN criticizes WILLETT's conclusions about sunspot-temperature relations and predicts next sunspot maximum about 1957, not 1962. WILLETT replies that it is most unlikely that next maximum will be reached by 1958. *Subject Headings:* **1. Long range forecasting 2. Sunspots 3. Climatic variations. I. Willett, Hurd C.**—*C.E.P.B.*

3.11–76 551.509.33:551.543.3

Fukuoka, A., **A study on 10-day forecast (A synthetic report).** *Geophysical Magazine, Tokyo*, 22(3):177–208, Feb. **1951.** 15 figs., 3 tables, equations. **MH-BH**—Several methods

of 10-day forecasting are examined. First, the periodicities in atmospheric pressure at one place, in propagation of long period pressure waves (36-day wave is said to be conspicuous), in short period pressure waves (periodicities of 5, 7 and 9 days were found in the Far East), and in periodic oscillation in the mid-latitude high pressure belt are reviewed. Second, the analog method is examined and statistical methods applied. By using the complex analog method, better results were obtained than by single analogs. The most promising method was the use of "oscillation analysis" of the daily pressure field over the Northern Hemisphere. It is based on the idea that when the potential temperature gradient is strong from south to north, anticyclones build up over the continents, bringing cold air south in the eastern boundaries and warm air north on the western side of the continents. This process weakens the potential temperature gradient and the highs break down. Then radiation in the Arctic again builds up this gradient and the whole thing starts over again. These oscillations are examined for the winter months in a number of years and indexes computed. *Subject Headings:* **1. Extended forecasting 2. Periodicities 3. Analogs 4. Pressure oscillations 5. Potential temperature gradient 6. Anticyclogenesis 7. Japan.**—*M.R.*

3.11–77 551.509.33

Namias, Jerome, **Problems associated with extending the time range of weather prediction.** *New York Academy of Sciences, Transactions, 2nd Ser.*, 14(4):177–179, Feb., **1952.** 6 refs. **MH-BH**—According to the author, the key to long range forecasting lies in further research on the "anomalous states of the general circulation as reflected by composite of mean maps." The purpose of such research would be to determine "what produces the primary controlling perturbations" and with the aid of the Rossby and Bjerknes theory, "why a model developed for use on daily circulation patterns seems to have some validity when applied to averages for long time intervals." It is emphasized that anomalies in the character and displacements of the large scale centers of action cannot be completely explained and forecast either by statistical correlation methods or by study of irregular nonseasonal solar variations. *Subject Heading:* **1. Long range forecasting.**—*M.P.K.*

3.11–78 551.509.33(497.1)

Obuljen, A., **O problemu dugoročnih prognoza vremena.** [On the problems of long range forecasting.] *Yugoslavia. Hidrometeorološka Služba, Hidrometeorološki Glasnik*, 3:80–85, **1950.** In Croatian. **DWB**—In discussing objectives and methods of long range forecasting the author sums up his experience at the synoptic division of the Yugoslavian Hydrometeorological Service. It has been attempted to prepare 5- and 10-day forecasts of temperature and precipitation and also seasonal and annual forecasts with emphasis on the harvesting and planting seasons. The method used was mainly based on the extrapolation of the general synoptic situation, since the vast statistical material on the synoptic elements available for the Northern Hemisphere has not yet been satisfactorily evaluated in respect to Yugoslavia. The author offers suggestions for the future development of a Yugoslavian long range weather forecasting program. *Subject Headings:* **1. Long range forecasting 2. Agro-meteorological forecasting 3. Yugoslavia.**—*G.T.*

3.11–79 551.509.33:551.543

Rodewald, Martin, **Die Anomalie-Tendenz.** [The anomaly tendency.] *Annalen der Meteorologie*, 4(10–12):465–469, **1951.** fig., table, 7 refs. German and English summaries p. 465. **DWB**—Author introduces the term "anomaly tendency" a to characterize the changes of mean pressure over 3 months. Thus $a(\mathrm{X}-\mathrm{XII}) = (\Delta p\,\mathrm{XII} - \Delta p\,\mathrm{XI}) - (\Delta p\,\mathrm{XI} - \Delta p\,\mathrm{X})$ where $\Delta p\,\mathrm{XII}$ is the pressure anomaly for December. From values of a for Oct.–Dec. at Edinburgh an indication of the character of the coming mid-winter in Europe can be found; plotting distribution of a may be better. *Subject Headings:* **1. Long range forecasting 2. Pressure anomalies.**—*C.E.P.B.*

3.11–80 551.509.33:551.577.32(6)

Sellick, N. P. (*Met. Office, Salisbury, S. Rhodesia*), **Seasonal forecasting.** (In: **African Regional Scientific Conference, Johannesburg, Oct. 17–28, 1949,** 2:46–49. **1950.** In English, French summary p. 46.) **DWB**—Various aspects of the problem of preparing a forecast of

seasonal rainfall are discussed. GILBERT WALKER's method of seasonal forecasting by correlating variations of rainfall which it is desired to forecast with previous variations of meteorological elements was introduced into Southern Rhodesia in 1922. The reliability of the forecasts based upon an equation involving the height of the Nile flood, pressure at Rio de Janeiro and temperature at Mauritius was found to be not greater than could be expected by chance. *Subject Headings:* **1. Rainfall forecasting 2. Seasonal forecasting 3. Africa. I. Walker, Gilbert.**—*I.L.D.*

3.11–81 551.509.33:551.543.3

Walden, Hans, **Über die Beziehungen zwischen meteorologischen Zyklen und den sogenannten "Synchronisierungsverfahren" zur Mittelfristvorhersage.** [On the relations between meteorological cycles and the so-called "synchronizing method" of medium range forecasting.] *Annalen der Meteorologie*, 4(10–12):470–475, **1951.** 3 figs., 16 refs. German and English summaries p. 470. **DWB**—Author plots centers and areas covered by quasi-periodic recurrences of low or high pressure at intervals of 18-72½ days in 1947–8. Reality and relation to singularities, and use in extended forecasting, are discussed. As an example of a longer cycle an 8.4 month rhythm in rainfall of Holstein (1947-51) is shown. *Subject Headings:* **1. Extended forecasting 2. Pressure waves.**—*C.E.P.B.*

3.11–82 551.509.53

Hartnett, William J. (*Weathercasts, St. Louis*), **Accurate temperature forecasting helps in gas operations.** *American Gas Journal*, New York, 174(5):27, 30, 48–49, May **1951.** port., photos, graph. **DLC**—The author, president of Weathercasts of America, St. Louis, explains the importance and the practice of regular weather forecasts applied to requirements of gas companies. Weather is declared to be "the most important single factor in gas demand for any given day." It is pointed out that precalculation of demand is essential for maintaining necessary gas pressure and smooth operation. Forecasts for 72-, 48-, 24- and 12-hour periods are given in terms of average temperature and of difference in temperature at beginning and close of the "gas day," and revised every few hours. Many facts and examples of details involved in gas dispatchers' work are discussed. *Subject Headings:* **1. Temperature forecasting 2. Gas operations.**—*G.T.*

3.11–83 551.509.58:632.187

Barrows, J. S., **Fire behavior in Northern Rocky Mountain forests.** *U. S. Forest Service. Northern Rocky Mountain Forest and Range Experiment Station, Missoula, Montana, Station Paper*, No. 29, May **1951.** 103 p. 53 figs., 15 tables, 8 refs. **DWB**—Methods of observing essential weather elements as conducted in the Northern Rocky Mountain Forest Region for the past 30 years and the role of weather in determining fire danger and in control of forest fires are emphasized in this report. In Chap. II, on the "Principles of Combustion," the theoretical and empirical factors such as wind, relative humidity, turbulence, lightning, etc., are discussed; schematic or popular diagrams illustrating points made are included. Chap. III is devoted entirely to the weather factors given above, plus precipitation, cloud cover, temperature and fuel moisture, and their integration into one fire danger index. Fire behavior indexes are also treated. *Subject Headings:* **1. Fire weather forecasting 2. Fire danger rating 3. Northern Rocky Mountains. I. U. S. Forest Service. Northern Rocky Mountain Forest and Range Experiment Station.**—*M.R.*

3.11–84 551.509.58:632.187(71)

Macleod, J. C., **The effect of night weather on forest fire danger.** *Canada. Dominion Forest Service, Forest Fire Research Note*, No. 14, **1948.** 27 p. tables, graphs, refs. **DWB**—Report on observations made by the Dominion Forest Service, principally at the Kananaskis Forest Experiment Station, Seebe, Alberta, Canada, during the forest fire seasons of 1946–47. Night weather conditions and their application to fuel moisture are analyzed and arranged in tables for practical use. Hygrothermographs and photos of equipment are reproduced. *Subject Headings:* **1. Fire weather forecasting 2. Forest fires 3. Alberta, Canada. I. Canada. Dominion Forest Service.**—*G.T.*

3.11–85 551.509.58:699

Yoshida, S., **On relations between fires and meteorological conditions (on the fires in rural districts).** *Society for the Long-Range Forecast Research of Tohoku District, Journal,* 11(1):5–13, March 1951. tables, graphs. In Japanese, English summary p. 50–51; headings in English. **DWB**—Fires in housing district of Iwate show a marked inverse relation to relative humidity. Fires, especially extensive ones, are relatively most frequent in spring, the season of strong winds. Diurnal variations are mainly due to human factors. Fires most often begin in anticyclonic weather. Issue of fire warnings is discussed. *Subject Heading:* **1. Fire weather forecasting.**—*C.E.P.B.*

CLOUD SEEDING AND ARTIFICIAL WEATHER CONTROL

3.11–86 551.509.66(494)

Bider, M. (*Basel*), **Versuche zur Hagelbekämpfung.** [Attempts to prevent hailstorms.] *Leben und Umwelt,* Basel, 6(12):273–279, Sept. 1950. **DWB**—The author discusses the problem of cloud dispersion by exploding rockets. The problem figured on the agenda of an international conference at Graz in 1902. Experiments were made in 1935 in Beaujolais, France, with success claimed by participants. Similar experiments have been in process in the Magadino Valley, Tessin, Switzerland, since 1948. Forty-eight operators armed with special rockets, whose altitudinal ranges are 600 and 1200 m, are in continual readiness for hailstorm warnings. They prepare detailed records of rockets fired and of the synoptic situation at the time. The experimental project is planned to be carried on for 5 years. The author finds no possible physical explanation for ultimate effectiveness of the method. He also mentions cloud seeding as a possible alternative but reserves his final opinion on the subject. Storm clouds in the Magadino Valley and a rocket about to be fired are shown in photographs. *Subject Headings:* **1. Hail prevention 2. Cloud dissolution 3. Rocket explosions 4. Cloud seeding 5. Magadino Valley, Switzerland.**—*G.T.*

3.11–87 551.509.67:34

California. Legislature. Senate, **Senate bill No. 617, An act to provide for the regulation and licensing of interference or attempt to interfere by artificial means with natural condensation and precipitation of rain, snow, moisture or water in any form contained in the atmosphere . . . 1951. DWB**—Any activity aimed at artificial stimulation or prevention of precipitation without a license issued by the Department of Public Works acting through the State Engineer is prohibited through this act. Instructions are given regarding application for such license and notice of intended operations. Provisions are made for emergency nucleation projects. *Subject Headings:* **1. Artificial precipitation 2. Laws 3. California.**—*G.T.*

3.11–88 551.509.67

Krown, L., **Meteorological aspects of stimulating artificial precipitation in Israel.** (In: Israel. Rainfall Research Committee, **Symposium on artificial rain.** Hakirya, Aug. **1951.** p. 56–59. 5 refs. In Hebrew, English summary p. 15–16.) **DWB**—Meteorological conditions and extent of seeding necessary for the production of artificial rain and the results of 14 cloud seeding experiments in Israel are summarized. *Subject Headings:* **1. Artificial precipitation 2. Cloud seeding 3. Israel.**—*I.L.D.*

3.11–89 551.577.1 551.509.67

Ludlam, Frank Henry, **Artificial and natural shower formation.** *Weather,* 7(7):199–204, July 1952. 2 figs., photos. **DWB**—Sets out physics of growth of cloud particles exceeding critical diameter of .01 in., growth of ice crystals into hailstones and raindrops, and artificial shower stimulation by dry ice or AgI or by spraying large droplets into cloud base. *Subject Headings:* **1. Rain formation 2. Cloud seeding 3. Silver iodide.**—*C.E.P.B.*

3.11–90 551.509.67(791)

MacCready, Paul B., Jr., **Results of cloud seeding in central Arizona, winter 1951.** *American Meteorological Society, Bulletin,* 33(2):48–52, Feb. 1952. 2 figs., 4 refs. **MH-BH**—Cloud

seeding operations were conducted during the winter of 1951 over an area of 10,000 sq mi in central Arizona. The normal precipitation in the project and comparison region for each month was calculated as follows: "the sum of all monthly normals for the U. S. Weather Bureau stations in the area having normals in the published "Climatalogical Data" is divided into the sum of all monthly precipitation for those stations, and the ratio expressed as a percentage." And the percent of monthly normal precipitation in the control area was assumed to represent the estimate of naturally occurring percent of normal precipitation in the test area. The monthly increases in rainfall in the seeded region were respectively: 15% (Jan.), 31% (Feb.), 41% (March), 54% (April). The increase in precipitation was found to be roughly proportional to the amount of seeding equipment and its timing. A detailed analysis of the statistical basis for evaluating the effect of seeding is presented. *Subject Headings:* **1. Artificial precipitation 2. Cloud seeding 3. Arizona.**—*I.L.D.*

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

STRUCTURE OF THE ATMOSPHERE

(*See also items:* 3.11–7, 3.11–11, 3.11–44, 3.11–50, 3.11–143, 3.11–256, 3.11–258, 3.11–261, 3.11–277)

3.11–91 551.510.3:551.511

Doporto, Mariano, **Dynamical aspects of the constancy of air density at 8 km.** *Eire. Meteorological Service, Geophysical Publications*, 3(6), **1951.** 31 p. 15 figs., 19 tables, 25 refs. **DWB**—Observations show that the standard deviation of the air density from its average value is a minimum at the so called "isopycnic layer" at a height of approximately 8 km. The mechanism by means of which the air density at this layer is maintained constant, and the practical and theoretical significance of this layer are discussed. In the "isopycnic layer" a maximum of pressure variability and a maximal correlation between the height of the troposphere and the pressure at the upper atmosphere and between temperature and pressure in the same level is observed. Isobaric charts for the 8 km level would give the best representation of tropopause waves. *Subject Headings:* **1. Upper troposphere 2. Air density 3. Dynamic meteorology.**—*A.A.*

3.11–92 551.510.41:523.4

†*Kuiper, Gerard, **Planetary and satellite atmospheres.** *Physical Society of London, Reports on Progress in Physics*, 13:247–275, **1950.** 10 plates, 2 tables, bibl. p. 273–275. **DWB**—Results of infrared spectroscopic observations of atmospheres of planets tabulated in a form which enables comparison with composition of earth's atmosphere. Visual and photographic observations of each planet, and interpretation thereof given at considerable length. Several hundred references are given to the work of over a hundred authors in this field, and the literature is amply reviewed in the text. The origin and photochemistry of planetary atmospheres and the literature on the Earth as a planet have been omitted from this discussion. *Subject Headings:* **1. Planetary atmospheres 2. Infrared spectroscopy 3. Carbon dioxide in the atmospheres of planets 4. Progress in physics.**—*M.R.*

3.11–93 551.510.41:546.21

Moses, H. E. (*Columbia Univ.*), and Wu, Ta-you (*Ottawa*), **A self-consistent treatment of the oxygen dissociation region in the upper atmosphere.** *Physical Review*, New York, 2nd Ser., 83(1):109–121, July 1, **1951.** 5 figs., refs., 32 equations. **DLC**—Theory is developed for determining degree of dissociation and recombination of molecular or atomic oxygen, and the temperature at 100–140 km. Calculations are made in detail and results presented graphically. Pressure from 100 to 140 km is shown graphically for various types of soundings (rocket and radio wave). Appendices show various derivations such as the equations for steady state in the detailed model, time required to reach dissociative steady state, the radiative recombination coefficient, cross sections for three-body recombination collisions, discussions, of the work of PENNDORF and RAKSHIT, etc. *Subject Headings:* **1. Oxygen dissociation 2. Ozonosphere 3. Upper air computation. I. Penndorf, R. II. Rakshit, H.**—*M.R.*

3.11–94 551.510.42

Hewson, E. Wendell (*Mass. Inst. of Tech.*), **Meteorological influences and their application to control at the source.** *Meteorological Monographs*, Boston, 1(4):5–6, Nov., 1951. **MH-BH**—The general aspects of meteorological control of atmospheric pollution are outlined. Wind direction, speed and turbulence are the primary criteria. Topography, stack height, narrowness of streets in big cities and flexibility of plant operations are further considerations. *Subject Headings:* **1. Atmospheric pollution control 2. Topographic effects.**—*M.R.*

3.11–95 551.510.42:551.58

Landsberg, Helmut E. (*Dir. GRD, Cambridge, Mass.*), **Climatology and its part in pollution.** *Meteorological Monographs*, Boston, 1(4):7–8, Nov. 1951. **MH-BH**—A concentrated survey of the most pertinent facts regarding the effect of climate and microclimate on air pollution and of pollution on climate. The problem has been recognized for at least 3 centuries. Recent determinations show that air in cities can contain 150 times as much pollution as the air over the oceans. Effect on fog, rainfall, solar radiation, visibility, and possibly on the large scale circulation pattern is considered. Wind, turbulence, stability, rainfall, etc. in turn affect pollution concentration although effect is often different for natural (dust) than for artificial contaminants. *Subject Headings:* **1. Atmospheric pollution 2. Climatology.**—*M.R.*

3.11–96 551.510.42:57(98)

Polunin, Nicholas and Kelly, C. D., **Arctic aerobiology. Fungi and bacteria, etc., caught in the air during flights over the geographical North Pole.** *Nature*, London, 170(4321):314–316, Aug. 23, **1952.** 6 refs. **DWB**—Spores were collected on flights from Alaska in Sept. 1948 and March 1949. The apparatus is described. Results were compared with origin of air mass. In Sept. live spores were found even at 8500 ft over the pole in air of mixed origin; in the Arctic generally they were most frequent in air of southerly origin. In March the air was nearly but not quite sterile. *Subject Headings:* **1. Aerobiology 2. Arctic.**—*C.E.P.B.*

3.11–97 551.510.42:06

Smoke Abatement League of Cincinnati, Hamilton County, Ohio, **Annual soot and dustfall analysis, 21st, July 1, 1950–June 30, 1951.** Dec. 14, **1951.** 20 p. tables, graphs. **DWB**—Comparative data on wind, temperature, heating-degree days, precipitation, sunshine and monthly amounts of air-borne combustible and noncombustible solids at several points in Hamilton County are presented in tables and graphs and commented on. The average amount of monthly soot and dustfall in Cincinnati, Ohio, during the 12 months ending June 30, 1951 is given as 29.2 tons per sq mi. This means "a temporary halt in the downward trend for the four-year period starting with July 1, 1947," mainly attributed to low average temperature and the resulting increase in heating and to dust moved by west winds during a storm on July 13, 1950. *Subject Headings:* **1. Smoke abatement 2. Dust fall analysis 3. Soot falls 4. Cincinnati, Ohio.**—*G.T.*

3.11–98 551.510.52(649)

*Font Tullot, Inocencio (*Izaña Aerolog. Obs.*), **El espesor de la capa superficial de aire marítimo en la región de las Islas Canarias.** [Thickness of the surface layer of sea air in the Canary Island region.] *Revista de Geofísica*, Madrid, 10(40):281–291, Oct./Dec. **1951.** 5 figs., 3 tables. **DWB**—The diurnal and seasonal variations in thickness (as computed indirectly through cloud observations) of the layer of warm, humid maritime air overlying drier, cooler air has served as a primary tool in weather forecasting for the Canary Island area. Relationships between variations of the cap of maritime air and other meteorological elements are illustrated in tabular and graphical form. *Subject Headings:* **1. Cloud height data 2. Weather forecasting 3. Marine meteorology 4. Pico del Teide, Tenerife 5. Canary Islands.**—*M.P.K.*

3.11–99 551.510.53:551.524.7

King, Jean I., **Radiative cooling of an isothermal and a non-isothermal stratosphere.** Utah. University. Dept. of Physics, Contract AF19(122)-392, Stratospheric radiation, Technical Report No. 1, May 1, **1951.** 26 p. 4 figs., 2 tables, 10 refs., eqs. **DWB**—Method of STRONG and PLASS of solving SCHWARZSCHILD's equation used for determining radiational

cooling rate of an isothermal stratosphere treating upward and downward beams separately, including a theoretical calculation of the maximum cooling rate (1.8°C per day for total of H_2O, CO_2 and O_2 bands) in such a stratosphere. Then there is a development of radiational temperature, changes in the stratosphere for various nonisothermal temperature distributions (heating rates for various models shown graphically), showing that the isothermal condition is stable and the radiation effects of the nonisothermal case restore the stratosphere to an isothermal condition. *Subject Headings:* **1. Temperature of the stratosphere 2. Stratospheric radiation 3. Radiation balance. I. Utah. University. Dept. of Physics II. Contract AF19(122)-392.**—*M.R.*

3.11–100 551.510.534:551.543

Fleagle, R. G., **Remarks on "Possible effects of ozonosphere heating on sea-level pressure."** Reply by Wexler, Harry. *Journal of Meteorology*, 8(3):200–202, June **1951.** 3 refs. **DWB**—Dr. Wexler's generalizations in the paper "Possible effects of ozonosphere heating on sea-level pressure" (*J. of Met.* 7:370–381, 1950; *see item* 2.3–102, March 1951, *MAB*) are limited since he assumes an incompressible motionless atmosphere and stable pressure changes. Dr. Wexler defends the use of a simplified model because the properties of the short wave radiations from the sun and heating effect on the upper atmosphere are little known, and also maintains that some of Dr. Fleagle's objections are the result of a misunderstanding. *Subject Headings:* **1. Ozonosphere heating 2. Pressure variations. I. Wexler, Harry.**—*I.L.D.*

3.11–101 551.510.535

Bates, D. R. and Massey, H. S. W., **On negative ions of molecular oxygen in the *D*-layer.** *Journal of Atmospheric and Terrestrial Physics*, 2(4):253–254, **1952.** 6 refs. **MH-BH, DWB**—Referring to recent (1951) measurements by M. A. Biondi of rate of attachment of slow electrons to O_2, authors calculate day negative ion to electron ratio, obtaining mean and extreme values of 0.5 and 50 at 75 km and 0.05 and 5 at 90 km. *Subject Headings:* **1. Ionospheric research 2. D layer.**—*C.E.P.B.*

3.11–102 551.510.535:550.381

Bates, D. R. and Massey, H. S. W., **The negative ion concentration in the lower atmosphere.** *Journal of Atmospheric and Terrestrial Physics*, 2(1):1–13, **1951.** fig., 3 tables, 31 refs., 23 equations. **MH-BH**—Formation and destruction of negative ions in upper atmosphere and ratio λ of negative ions to electrons are examined. The main objection to the dynamo theory that quiet day magnetic variations arise from lunar and solar tides in conducting ionized layers across the earth's magnetic field is that it requires local tidal motion 6000 times that at ground level. Transverse ionic conductivity at 75 and 90 km is calculated on various assumptions. It is found that daytime negative ion concentration in D and E is quite inadequate to provide dynamo currents of sufficient magnitude. Fade-out enhancement of electron concentration in lower ionosphere is briefly discussed. *Subject Headings:* **1. Ionospheric tides 2. Terrestrial magnetism.**—*C.E.P.B.*

3.11–103 551.510.535

Bracewell, R. N., and Bain, W. C., **An explanation of radio propagation at 16 kc/sec. in terms of two layers below *E* layer.** *Journal of Atmospheric and Terrestrial Physics*, 2(4):216–225, **1952.** 5 figs., 18 refs. **MH-BH, DWB**—Observations of 16 kc/sec transmission from Rugby at Cambridge (90 km) and Aberdeen (535 km) indicate two distinct superposed banks of ionization provisionally named Dα and Dβ. Heights uncertain but probably about 70 ± 8 km at noon and 15–18 km higher at night, with a sharp change around sunrise and sunset. *Subject Heading:* **1. D layer.**—*C.E.P.B.*

3.11–104 551.510.535:551.557

Gerson, N. C., **Bewegungen der abnormalen E-Schicht der Ionosphäre.** [Movements of the abnormal E layer of the atmosphere.] *Zeitschrift für angewandte Physik*, 4(3):81–82, March **1952.** 3 figs. **DLC**—Observations of E_s "clouds" (with the help of radio amateurs) at about 110 km in U. S. June 16–17, 1949, are plotted. One in the northeast moved from ENE at 130 km/hr. A smaller one in 100°W moved from SSE, 300 km/hr, and a third near

40°N, 115°W moved from E at 100 km/hr. The sudden appearance and disappearance of the clouds is attributed to vertical movements. *Subject Headings:* **1. Ionospheric winds 2. E layer.**—*C.E.P.B.*

3.11–105 551.510.535

Schumann, W. O., **Über die Dämpfung der elektromagnetischen Eigenschwingungen des Systems Erde-Luft-Ionosphäre.** [On the damping of the natural electromagnetic oscillations of the system earth-air-ionosphere.] *Zeitschrift für Naturforschung*, 7a(3–4):250–252, March–April **1952.** eqs. **DLC**—A theoretical equation for the damping of the lowest frequencies is developed, which should permit the calculation of the effective height of the atmosphere and the effective conductivity of the ionosphere by emitting short impulses. *Subject Heading:* **1. Ionosphere.**—*C.E.P.B.*

3.11–106 551.510.535:551.507.362:550.38

Singer, Fred S.; Maple, E. and Bowen, W. A., Jr., **Evidence for ionosphere currents from rocket experiments near the geomagnetic equator.** *Journal of Geophysical Research*, 56(2):265–281, June **1951.** 10 figs., 4 refs. **MH-BH**—Results obtained from two aerobee rocket soundings made from a seaplane tender (Norton Sound) in March 1949, at 11°S and 89°W, about 1000 miles west of Huancayo, Peru. Instrumentation described and shown diagramatically and in photograph. Calibration, flight history (to 345,000 ft altitude) and method of analysis described. Magnetic field vs. time shown in graph for both soundings, and compared with theoretical curve from inverse cube law. Departures from this law indicate existence of a current layer in the atmosphere between 93 and 105 km. Surface data from world-wide observatories indicate *some* disturbances on sun or earth, but *no unusual* disturbances. Authors claim results confirm dynamo theory of daily magnetic variation. *Subject Headings:* **1. Ionospheric currents 2. Terrestrial magnetism 3. Rocket soundings 4. Magnetic storms 5. Aerobee rockets 6. Southeast Pacific Ocean.**—*M.R.*

3.11–107 551.510.536

Haber, Fritz, **Wo beginnt der "Weltraum"?** [Where does "space" begin?] *Umschau*, 52(16):490–491, Aug. 15, **1952.** 2 refs. **DLC**—There is no definite boundary between the atmosphere and outer space. Different figures are deduced from lack of air (14 km), ozone toxicity (20 km), pure radiation climate (20–50 km), absorption of particle radiation (30 km), protection against meteors (150 km), etc. *Subject Heading:* **1. Exosphere.**—*C.E.P.B.*

DYNAMICS OF AN ATMOSPHERE

(*See also item:* 3.11–91 *and* Special Bibliography on Flight Turbulence, P. 1135)

3.11–108 551.511:551.515.8

Kaiser, H., **Über den Wärmehaushalt der Erdoberfläche und die Luftmassen.** [On the heat economy of the earth's surface and air masses.] *Meteorologische Rundschau*, 5(3–4): 53–55, March–April **1952.** 2 figs., 8 refs. **DWB**—The variation of the meteorological elements and heat exchange at the surface at Potsdam on Dec. 13–14, 1947, following a cold wave, is analyzed on the basis of 2-hourly readings of air temperature and humidity (15 cm and 2 m), earth temperature (1–50 cm) and radiation. *Subject Headings:* **1. Heat exchange 2. Air masses.**—*C.E.P.B.*

3.11–109 551.511:551.513.1

Kuo, Hsiao-lan, **A note on the kinetic energy balance of the zonal wind systems.** *Tellus*, 3(3):205–207, Aug. **1951.** table, 3 refs., equations. **MH-BH**—The two processes "that may produce the needed transport of angular momentum from the zones of surface easterlies to those of surface westerlies," namely the large scale mean convective process characterized by ascending motions in lower latitudes and descending motions in higher latitudes and large scale eddy motions, are analyzed with regards to their efficiency in maintaining the kinetic energy balance of the mean zonal flow. It is shown that the general circulation is maintained primarily by its large scale eddy process. *Subject Headings:* **1. Transport of momentum 2. General circulation.**—*I.L.D.*

3.11–110 551.511

Sellick, N. P. and Sutcliffe, R. C., **The quasi-geostrophic wind approximation.** *Royal Meteorological Society, Quarterly Journal*, 78(336):266–268, April, 1952. ref., 3 equations. **DWB**—Sellick examines tendencies in thickness of a layer of air bounded above and below by isobaric surfaces determined to fit instantaneous flow patterns, and obtains results differing from those of Sutcliffe (1947) assuming quasi-geostrophic motion. Sutcliffe replies. *Subject Heading:* **1. Pressure tendencies.**—*C.E.P.B.*

3.11–111 551.511:551.515

Stümke, H., **Zur Berechnung der Drucktendenz bei Wärmezufuhr innerhalb einer isothermen Atmosphäre von konstanter Grundgeschwindigkeit.** [On the calculation of the pressure tendency accompanying advection of heat in an isothermal atmosphere of constant velocity at the surface.] *Zeitschrift für angewandte Mathematik und Mechanik*, Berlin, 32(2/3):68–75, Feb./March 1952. 35 equations, 5 refs. German, English, French and Russian summaries p. 68. **DLC**—Author considers the pressure tendency in isothermal frictionless air moving with constant velocity from west, on which is superposed a steady heat supply which vanishes at the earth's surface (supposed plane). The mathematical discussion gives an expression involving latitude, temperature and fundamental velocity. This gives the first phase of a disturbance involving a new term in the energy balance. Further developments can be followed by repeating the process for time intervals of about an hour. *Subject Heading:* **1. Stationary perturbations.**—*C.E.P.B.*

3.11–112 551.511

Watanabe, T., **Unstationary effect and the absolute vorticity of the second kind.** *Meteorological Society of Japan, Journal, 2nd Ser.*, 29(9):303–310, Sept. 1951. fig., ref., equations. In Japanese, English summary p. 310. **MH-BH**—Author defines "absolute vorticity of the second kind" as $\zeta+\lambda+\partial\theta/\partial t$ (relative vorticity+Coriolis parameter+local variation of wind direction). This extends the expression for gradient wind to nonstationary cases. The criterion of dynamic stability is given by the sign of the expression. *Subject Heading:* **1. Vorticity theory.**—*C.E.P.B.*

GENERAL CIRCULATION

(*See also items:* 3.11–109, 3.11–120, 3.11–121)

3.11–113 551.513:551.515.7

Arakawa, H., **The anticyclonic eddies just south of jet stream.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 5(1):1–4, 1952. 2 figs., equations, 11 refs. English, German and French summaries p. 1. **DWB**—The equations of motion in an anticyclone are satisfied in a zone of large shear with anticyclonic vorticity. This is usually found just south of the jet stream. *Subject Headings:* **1. Jet stream 2. Anticyclones.**—*C.E.P.B.*

3.11–114 551.513.1:551.43

Berkofsky, Louis, **Stationary mountain perturbations.** *Journal of Meteorology*, 9(1):72–75, Feb. 1952. 4 figs., 2 tables, ref., 7 equations. **MH-BH**—The N–S wind component of a stationary perturbation due to topography is computed for $U=20-100$ km/hr and $K=10^3-10^7$ cm^2/sec for points 120°–74°W along 40°N. *Subject Heading:* **1. Stationary perturbations.**—*C.E.P.B.*

3.11–115 551.513.2:551.589.1

Brezowsky, Helmuth; Flohn, Hermann and Hess, Paul, **Some remarks on the climatology of blocking action.** *Tellus*, 3(3):191–194, Aug. 1951. 3 figs., 11 refs. **MH-BH**—The annual course and the secular variations of the frequency of Atlantic blocking highs in Europe are analyzed on the basis of the *reversed* "Catalogue of European Large-Scale Weather Situations" for the period 1881–1950. The blocking action is classified into two groups: 1) anticyclonic axis over northeastern Atlantic (A) and 2) anticyclonic axis over northern Europe (E). The E group is most frequent from October to May; the A group is concentrated between the

middle of April and the middle of June. The frequency of Atlantic blocking highs varies somewhat from year to year. A statistically nonverifiable relationship is found between peak blocking highs and sunspot minima. *Subject Headings:* **1. Blocking action 2. Climatology 3. Northeastern Atlantic 4. Northern Europe.**—*I.L.D.*

3.11–116 551.513.2:551.557

Murray, R. and Daniels, Sylvia, **Transverse flow at entrance and exit to jet streams.** *Great Britain. Meteorological Research Committee, M.R.P.*, 690, 19 November **1951.** Mimeographed. 6 p. 4 figs., 2 tables, 5 refs. **DWB**—The wind components across the jet axis were found from 200 mb below to 100 mb above maximum wind levels in 1948–50. A component of 8 knots from right to left (looking downstream) was found at the entrance, 6 knots from left to right in center, and 12 knots from left to right at exit. Mean pressure levels were 279 mb at entrance and 306 mb at exit. The probable circulations are shown schematically. *Subject Heading:* **1. Jet stream.**—*C.E.P.B.*

ATMOSPHERIC DISTURBANCES

(*See also items:* 3.11–70, 3.11–74, 3.11–108, 3.11–111, 3.11–113, 3.11–148, 3.11–153, 3.11–197, 3.11–200, 3.11–240)

3.11–117 551.515.8:550.34(261)

Donn, William L., **Studies of frontal, cyclonic and hurricane microseisms generated in the western North Atlantic. Introduction and Part I, Frontal microseisms.** Columbia University. Lamont Geological Observatory, Contract AF19(122)-441, Technical Reports on Seismology, No. 7, Oct. **1950.** 51 p. graphs, charts. **DWB**—First part of a three-part study of frontal (I), cyclonic (II) and hurricane (III) microseisms. In this paper a series of case histories of frontal microseismic storms and related marine weather conditions in the western North Atlantic area are given. Numerous data and seismograms are presented and valuable conclusions drawn as to period, amplitude, regularity and origin of frontal microseisms. Possible meteorological applications are indicated. *Subject Headings:* **1. Frontal microseisms 2. Microseismic storm detection 3. Marine meteorology 4. Western North Atlantic. I. Columbia University. Lamont Geological Observatory II. Contract AF19(122)-441.** —*G.T.*

3.11–118 551.515.1:550.34(261)

†§Donn, William L., **Studies of frontal, cyclonic and hurricane microseisms generated in the western North Atlantic. Part II. Cyclonic microseisms.** Columbia University. Lamont Geological Observatory, Contract AF19(122)-441, Technical Reports on Seismology No. 12, March **1951.** 57 p. 21 figs., 25 refs. **DWB**—Four extratropical cyclones during 1948–50 which resulted in microseismic activity along the Atlantic coast of the U. S. A. are analyzed in connection with the records from a number of seismographs in that area. Conclusions reached are: 1) cold fronts produce less intense activity and of shorter duration than large cyclones with high winds; 2) amplitudes of seisms are a function of dynamic conditions in storm as well as distance of center but have little relation to coastal surf or swell; 3) period-spectrum is a function of water depth in generating area, and of distance; 4) position and nature of storm can be estimated from characteristics of microseisms; 5) cold air streams and resulting turbulence are more effective than warm air, the latter only being effective in hurricanes. *Subject Headings:* **1. Extratropical cyclones 2. Frontal microseisms 3. Cyclonic microseisms 4. Microseismic storm detection 5. Western North Atlantic. I. Contract AF19(122)-441 II. Columbia University. Lamont Geological Observatory.**—*M.R.*

3.11–119 551.515.8:550.34

§Gilmore, Marion H. (*U. S. Navy, Miami, Fla.*), **Frontal microseisms.** *American Meteorological Society, Bulletin*, 32(9):346–355, Nov. **1951.** 21 figs. **MH-BH**—Microseismic data connected with cold fronts are presented in charts and graphs and case histories given. These and other data published earlier on tropical storm microseisms are discussed. The conclusion is that intensity of seisms depends on wind force, density of air mass and area involved in the action, and that the mechanism involved is the transfer of impulses through the ocean bottom

under the storm area by means of compressional water waves set up by the storm. *Subject Headings:* **1. Microseismic storm detection 2. Frontal microseisms.**—*From author's abstract.*

3.11–120 551.515.1:551.557:551.513

Newton, C. W.; Phillips, N. A.; Carson, J. E. and Bradbury, D. L., **Structure of shear lines near the tropopause in summer.** *Tellus*, 3(3):153–171, Aug. **1951.** 20 figs., 16 refs., 2 equations. **MH-BH**—In this detailed study of shear lines near the tropopause in summer, two cases in which frontal activity was weak and limited to the lowest layers were investigated in order to minimize the role of a subsiding air mass in "producing a vertical stretching and consequent concentration of vorticity in the higher atmosphere." A synoptic description of the period of July 6–10, 1950 based upon 200 mb charts is presented. The circulation over North America was characterized by the presence of two jet streams. It is suggested that the strong northerly flow culminating in shear line formation "depends upon a mutual interaction between the mass and velocity fields of jet-stream vortices located at different latitudes." Evidence is presented that vorticity may be generated in the free atmosphere. *Subject Headings:* **1. Shear lines 2. Jet stream 3. General circulation 4. Tropopause.**—*I.L.D.*

3.11–121 551.515.11:551.513.1

Berson, F. A., **A synoptic-aerological study of interaction between vortices.** *Tellus*, 3(3):172–190, Aug. **1951.** 9 figs., table, 20 refs., 11 equations. **MH-BH**—A theoretical and specific study of the movement and changes "of vortex-like system of a Low and a High moving in quasi-circular paths of unequal radii about a fixed point," as exemplified by a specific example of a cyclone and anticyclone over the northeastern Atlantic in October 1945. An attempt is made to represent the observational data and to explain them as an analog to the two-vortex model in hydrodynamics. Recent theories of large scale vortex motion in the atmosphere are reviewed and the relationship for vortex filaments, which are applicable to large scale pressure systems, are derived. "The observed paths and translational velocities are compared with those computed from the theoretical relationships" derived on the assumption of conservation of absolute vorticity. "The genesis and behavior of the system of vortices is also discussed in relation to a recent theory of composite baroclinic vortices. In part, the theory is confirmed by observational evidence as, e.g., air accelerated equatorward, drift of the cyclone in its early stage and an intensification of its upper part in a later stage when the center of the system of vortices is stationary." *Subject Headings:* **1. Atmospheric disturbances 2. Vorticity theory 3. Synoptic aerological studies.**—*I.L.D.*

3.11–122 551.515.21

Haque, S. M. A., **The initiation of cyclonic circulation in a vertically unstable stagnant air mass.** *Royal Meteorological Society, Quarterly Journal*, 78(337):394–406, July **1952.** 3 figs., 44 equations, 5 refs. **DWB**—Equations of motion derived in cylindrical co-ordinates are applied to investigate the perturbations in a vertically unstable stagnant air mass having infinite lateral extent and confined between two horizontal planes. A complete solution of the perturbation equation with the boundary conditions is derived. The boundary conditions are then varied by surrounding and surmounting the unstable air mass by stable air. It is shown that the horizontal extent of the unstable air mass has a definite upper limit which depends on the magnitude of instability, height of the disturbance, and the Coriolis parameter. The mathematical analysis is then applied to show that a tropical cyclone may originate from vertical instability. It is shown by a numerical illustration that the distribution and order of magnitude of the different meteorological elements are the same in the mathematical model as observed in the initial stages of a tropical cyclone. *Subject Heading:* **1. Hurricane dynamics.**—*Author's abstract.*

3.11–123 551.515.4:551.577.37(234.3)(436)

Held, A. (*Wels*) and Roller, M. (*Vienna*), **Die Feinstruktur des Sommermaximums der Gewitter und Starkregen in den Ostalpenländern.** [Detailed structure of the summer maximum of thunderstorms and of heavy rains in the eastern Alps.] *Wetter und Leben*, Vienna, 3(11/12):261–263, Dec. **1951.** fig., table. **MH-BH**—On the basis of a 100 years of record for Vienna, the author has analyzed the annual data of occurrence of most thunder-

storms and of heavy rainfall. A table showing summer ten-day means of days with heavy rain and with thunderstorms in Vienna and rainfall probability in the eastern Alps and Vienna is presented. The heavy rains attain their maximum incidence during the summer months in the first and third July decad. Low pressure troughs are frequently accompanied with brief very heavy rainfall. Most storms occur during the third decad in July. *Subject Headings:* **1. Thunderstorm frequencies 2. Rainstorms 3. Excessive rainfall frequencies 4. Eastern Alps 5. Vienna, Austria.**—*I.L.D.*

3.11–124 551.515.8:550.34

*Båth, Markus, **The distribution of microseismic energy with special reference to Scandinavia.** *Arkiv för Geofysik*, Stockholm, 1(13):359–393, **1951.** 24 figs., 4 tables, 20 refs. Also: *Sweden. (K.) Universitet. Meteorologiska Institutionen, Meddelande*, No. 22, **1951. MH-BH**—Theoretical study of the distribution of microseismic energy from a line source (the coast line), using records made at Bergen and Uppsala. Eighteen different synoptic situations are analyzed and results shown graphically and discussed with respect to the above theory. These same cases were discussed in detail in former work of author (*see item* 2.2–93, Feb. 1951, *MAB*) but not in the light of the "line source" theory here presented. A statistical survey of periods and amplitudes shows that periods are greater on N–S component, and at Uppsala than on E–W component and at Bergen, respectively. Amplitudes are greater at Bergen when a front passes the coast from W, but the reverse is true when a front passes the coast from N. Amplitude ratios can be explained only by a line source and not a point source in the cyclone. *Subject Headings:* **1. Frontal microseisms 2. Microseismic storm detection 3. Scandinavia.**—*M.R.*

3.11–125 551.515.83

Collmann, Wolfgang, **Beispiele zur Frage der Luftmassentransformation.** [Examples on the problem of air mass transformation.] *Annalen der Meteorologie*, 4(10–12):444–464, **1951.** 15 figs., tables, 22 refs. German and English summaries p. 444. **DWB**—Ten trajectories of gradient wind and 500 mb wind were plotted in N. Atlantic and Europe and from radiosondes changes of actual and equivalent-potential temperature, specific humidity and enthalpy were found in polar and tropical air. The results confirm that over the sea warm air loses about 100 cal/cm²/day while cold air gains 1000–2000 cal/cm²/day. *Subject Heading:* **1. Air mass modification.**—*C.E.P.B.*

3.11–126 551.515.8

Sonntag, D., **Kaltfronttypen des Mikrobarogrammes und eine Korrektion der Verdunstungslabilität.** [Cold front types of the microbarogram and a correction of evaporation lability.] *Zeitschrift für Meteorologie*, 6(3):74–79, March **1952.** fig., 14 refs. **MH-BH**—Six types of cold front are distinguished by the microbarograms of their passage. These show some similarity to the aerological synoptic types of H. FAUST and support his theory of evaporation lability (*see items* 9–68 and 11–54, Sept. and Nov., 1950, *MAB*). The mean temperature differences between cold and warm air, up to 500 mb, were examined for 120 cold fronts, and author's types are classified into stable and labile. *Subject Headings:* **1. Cold fronts 2. Evaporation lability.**—*C.E.P.B.*

3.11–127 551.515.8

Zubian, ZH. D., **K. voprosu o prostranstvennoĭ strukture frontov okkliuzii.** [On the problem of the spatial structure of occlusions.] *Meteorologiia i Gidrologiia*, No. 1:26–34, Sept. **1950.** 6 figs., 4 refs. **DLC**—The study is based on an analysis of the temperature fields of the different isobaric surfaces. The author presents two types of warm front occlusion: 1) when the front has a large vertical extension and normal slope and 2) when the front at low altitude above the surface turns into an inversion. An analysis of various synoptic situations is presented by means of surface and upper air charts and cross sections, and numerous examples are considered and discussed. It is claimed that BERGERON's scheme of the occlusion contains the incorrect idea that the air behind the warm front remains warmer at every altitude than air ahead of the warm front. Further analysis of synoptic situations showed that in most cases the air behind the warm front is warmer only near the ground, but at higher levels this

air can be frequently colder than the air ahead of the warm front at the same level. The systems of double and triple occlusions are not real. Charts showing isotherms for different isobaric surfaces are very important for frontal analysis. *Subject Headings:* **1. Occlusions 2. Synoptic studies.**—*N.T.Z.*

RADIATION AND TEMPERATURE

RADIATION

(*See also items:* 3.11–2, 3.11–6, 3.11–252)

3.11–128 551.521.1

Maede, Hans and Matzke, H., **Die Globalstrahlung im Zusammenhang mit typischen Wetterlagen, dargestellt am Beispiel von Greifswald.** [Global radiation in relation to typical weather conditions as presented at Greifswald.] *Zeitschrift für Meteorologie*, 6(1):15–22, Jan. **1952.** fig., 4 tables, 4 refs. **MH-BH**—The daily record of global radiation at Greifswald measured with a Robitzsch pyranograph over a period of 20 years has been summarized into decads and the annual variation of global radiation is analyzed. All days on which global radiation was measured are classified into twelve weather types (defined by H. MAEDE) and their monthly and annual frequency distributions are given. The annual variation of the specific, absolute, relative and standardized deviation of mean global radiation of a particular weather type from mean monthly global radiation of each of these weather types expressed in monthly means is given in tables and the radiation characterizing these weather types is analyzed. The effect of the coastal climate of Greifswald upon the global radiation and the bioclimatic significance of the radiation climate are discussed. *Subject Headings:* **1. Global radiation 2. Weather types 3. Greifswald, Germany.**—*I.L.D.*

3.11–129 551.521.11 551.576.2(73,798)

*U. S. Weather Bureau, **Sunshine and cloudiness at selected stations in the United States, Alaska, Hawaii, and Puerto Rico.** *U. S. Weather Bureau, Technical Paper*, No. 12, **1951.** 16 p. tables. **DWB**—Data on average number of hours of sunshine and percent of possible, as well as percentage of cloudiness and number of clear, partly cloudy and cloudy days for entire period of record available for several hundred stations in each of the states of the U. S., Alaska, Hawaii and Puerto Rico are given in tables, with no explanation or interpretation. *Subject Headings:* **1. Sunshine duration 2. Cloudiness 3. United States 4. Alaska.**—*M.R.*

3.11–130 551.521.13:517.512.2

*Abbot, Charles Greeley, **Periodicities in the solar-constant measures.** *Smithsonian Miscellaneous Collections*, 117(10), May 28, **1952.** 31 p. 6 figs., 7 tables, graph. **DLC**—Values of solar radiation based on over 40 years of observation, mainly at Mount Wilson Observatory, are tabulated and presented graphically. Twenty-three regular periodicities of variation in the solar constant, all adding up to a periodicity of $22\frac{3}{4}$ years, are established. The accuracy of measurement and the agreement of theoretical and observational values are discussed. The correlation between solar-constant departures and solar-contrast values is analyzed. *Subject Headings:* **1. Solar constant periodicities 2. Solar radiation measurements.** —*G.T.*

3.11–131 551.521.14:72

*Polli, Silvio, **Riflessione ottica di una superficie marina in condizioni naturali.** [Optical reflection of a sea surface under natural conditions.] *Geofisica Pura e Applicata*, 21:142–146, **1952.** fig., 2 tables, refs. Italian and English summaries p. 142. **MH-BH**—FRESNEL's theory for calculating proportion of reflected/incident radiation is reviewed and results for various sun's heights (0°–90°) compared with those observed by means of Weston photocells using Schott glass filters to allow recording of comparatively monochromatic radiation. Observations were made in July–Sept. 1951 over the port of Trieste in all types of weather, sea and solar angle 10°–80°. For angles $<60°$ the theoretical values are 2 or 3 times too low; for higher angles they are much too great. This varies slightly (50°–66°) for various colors of

light, the lowest angle being for UV light, the higher for green and white. *Subject Headings:* **1. Albedo of sea surface 2. Trieste.**—*M.R.*

3.11–132 551.521.3:551.521.2

Parmelee, George V. and Aubele, Warren W., **Radiant energy emission of atmosphere and ground. A design factor in heat gain and heat loss.** *Heating, Piping and Air Conditioning*, Chicago, 23(11):120–129, Nov. **1951.** 11 figs., table, equations, append. **DLC**—Equations and experimental data obtained with a special radiometer are presented for low-temperature long-wave-length radiation exchange between buildings and the atmosphere and ground. Heat flow data on sunlit glass are presented graphically. Heat loss on cloudless night is compared with heat loss when sky is overcast. The factor of radiation exchange is adapted to design calculation purposes. *Subject Headings:* **1. Terrestrial radiation 2. Heat exchange 3. Building design.**—*G.T.*

3.11–133 551.521.4:551.594.51:535.33(09)

Chapman, Sydney, **The emission spectra of the night sky and aurorae.** (In: International Conference on the Emission Spectra of the Night Sky and Aurorae, London, 1947, **Papers**) **1948.** p. 1–3. 2 refs.) **DWB**—An introduction to the conference and the 24 papers which follow, wherein the author reviews the progress in the particular field of auroral or night sky spectroscopy from 1916, when VEGARD identified 3 strong lines in the auroral spectrum, to 1925 when MCLENNAN and SHRUM identified the 5577Å line as a "forbidden" atomic oxygen line. Lord RAYLEIGH's work in that period, and the current contributions of the men doing work in ozone distribution (DOBSON and GÖTZ) and the radio physics (APPLETON, TUVE and others). *Subject Headings:* **1. Auroral physics research 2. Night sky spectroscopy 3. Ozone distribution 4. Light of the night sky 5. Auroral spectroscopy 6. Compendiums.**—*M.R.*

3.11–134 551.521.61:551.594.51:535.33

Bagariatskiĭ, B. A. and Mordukhovich, M. I., **Spektry poliarnykh siianiĭ v infrakrasnoĭ oblasti.** [Spectra of aurora borealis in the infrared region.] *Akademiia Nauk, SSSR, Doklady*, 82(1):45–47, Jan. 1, **1952.** 2 figs., 4 refs. **DLC**—The spectrum of the aurora borealis in the infrared region up to a wave length of 11,000Å is analyzed. The following spectral regions are established and described; these are: 7400–7600Å, 7650–7900Å, 8100–8150Å, 8250Å, 9050–9300Å, 9300–9550Å, 9800–10,500Å and 10,800Å. The spectrum of the aurora borealis is characterized by two regions, around 8000–8150Å and 9050–9300Å, which are not observed in the light of night sky. The regions 7650–7900Å and 8550–8950Å are more intense in the auroral spectra than in the spectra of the night sky. The region 9800–10,500Å is lacking in the auroral spectrum. The first positive system of molecular oxygen was not found in the spectra. The expected region (0=0) at 10,400Å was lacking. *Subject Headings:* **1. Auroral spectra 2. Infrared spectrum of aurora.**—*I.L.D.*

3.11–135 551.521.61

Brooks, Douglas Lee (*M.I.T.*), **Measurements of atmospheric radiation applied to the heat transfer by infrared radiation in the free atmosphere.** Thesis [*Ph.D.*]—Massachusetts Institute of Technology, **1948.** 74+p. 28 figs., numerous charts, diagrs. and tables, 24 refs. 92 eqs. **DWB**—After a lengthy review of methods of computing heat transfer by infrared radiation, the author attempts to derive an empirical curve from radiation measurements made by F. A. BROOKS and G. D. ROBINSON. Work of MÜGGE, MÖLLER, ELSASSER and BRUINENBERG is used as a basis for the theoretical derivations. The emissivity curve thus derived differs somewhat from those of ELSASSER and F. A. BROOKS. Computations of radiational temperature change for Swan Island, Portland, Maine and Point Barrow, Alaska up to 500 mb are made; computations also made for Boscombe Downs, England and Santa Maria, Calif. Values of cooling are found to be 20–50% greater than those determined from BRUINENBERG's tables. *Subject Headings:* **1. Radiational temperature change 2. Infrared radiation 3. Heat transfer.**—*M.R.*

3.11–136 551.521.63:523.75

Elwert, Gerhard (*Tübingen Univ.*), **Das kontinuierliche Emissionsspektrum der Sonnenkorona im fernen Ultraviolett und bei weichen Röntgenstrahlung.** [The continuous emission

spectrum of the sun's corona in the far ultraviolet and with soft Röntgen rays.] *Zeitschrift für Naturforschung*, Tübingen, 7a(2):202–204, Feb. 1952. fig., 11 refs., 3 eqs. **DLC**—A discussion of the electrophysics of the corona leads to an expression giving calculated curves of emission, in erg cm² at earth's distance, from 10–700 Å, showing peaks at 20–40 Å. This group has maximum absorption in 100–110 km in the earth's atmosphere. *Subject Headings:* **1. Sun's corona 2. Ultraviolet radiation.**—*C.E.P.B.*

3.11–137 551.521.6/7:523.3

Buettner, Konrad, **Lunar erosion.** *Astronomical Society of the Pacific, San Francisco, Publications*, 64(376):11–14, Feb. 1952. 6 refs., eqs. **DLC**—Notes on the effects of radiative erosion on the surface of the moon. It is assumed that atmospheric and even temperature erosion is absent but cosmic rays and solar protons, X-rays and UV radiation reach the moon without disruption by a magnetic field or atmosphere. It is estimated that 3×10^{16} cm^{-2} cosmic ray primaries have struck the moon in its life (10^9 years) and that they penetrate 10–20 cm of rock. Effects of eclipses considered quantitatively. LETTAU's recent work cited. (*See item* 2.8–76, Aug. 1951, *M.A.B.*) *Subject Headings:* **1. Lunar erosion 2. Cosmic radiation on moon 3. Radiation effects. I. Lettau, Heinz.**—*M.R.*

TEMPERATURE

(*See also items:* 3.11–99, 3.11–167, 3.11–169, 3.11–256, 3.11–260)

3.11–138 551.524.31

*Zoch, Richmond T., **On the variation of the average daily temperature at Washington, D. C.** *Washington Academy of Sciences, Journal*, 42(4):105–114, April 1952. 4 tables, 2 figs., refs. **DLC**—By recomputing each day's average temperature for the 31 days following the vernal equinox (for Washington, D. C., 1889–1948), the author has shown that there is more variability in daily mean temperatures based on noon–noon means than on midnight–midnight means. A possible explanation is the fact that cold waves are more apt to persist in the night and be modified in the middle of the day, thus giving a bias toward cold or small variability for mid–mid data, and towards warm or large variability for noon–noon. Data are given in extensive table and shown on scatter diagrams. *Subject Headings:* **1. Diurnal temperature variations 2. Temperature singularities 3. Washington, D. C.**—*M.R.*

3.11–139 551.524.31/2:551.524.4

*le Saulnier, J. and Roulleau, J. (*Établ. d'Études et de Recherches Met., Paris*), **Le gradient thermique vertical à Trappes.** [The vertical temperature gradient at Trappes.] *Journal Scientifique de la Météorologie*, 4(13):5–8, Jan./March, 1952. 3 tables. French, English and Spanish summaries p. 5. **DWB**—An analysis is made of radiosonde records for Trappes, France for period 1945–1950, to show mean annual and seasonal lapse rate in temperature for 4 times of the day (03, 05, 15 and 17h) in various layers from 0–500 m to 2000–3000 m and annual frequencies of lapse rate for all levels from 0–500 m up to 10–11 km. It is shown that the diurnal and seasonal variations are insignificant above 1500 m so that all observations regardless of time of day or season can be grouped together in studying lapse rates in the upper troposphere and stratosphere. *Subject Headings:* **1. Vertical temperature gradient 2. Lapse rates 3. Diurnal temperature variations 4. Seasonal temperature variations 5. Trappes, France.**—*M.R.*

3.11–140 551.524.34

Vialar, J., **Étude statistique des températures de Paris-Saint-Maur pour la période 1874–1945.** [Statistical study of temperatures at Paris-Saint-Maur during the period 1874–1945.] *Journal Scientifique de la Météorologie*, 4(13):20–37, Jan./March 1952. 3 figs., 5 tables. French, English and Spanish summaries p. 20. **DWB**—Statistical treatment of mean annual temperature records made at Paris-St. Maur from 1874–1945 shows an upward trend amounting to 2°C per century beginning in 1888 and continuing until 1945. The author believes that 1888 is a significant climatic turning point. No periodicity could be discovered in variations from year to year. A similar analysis of seasonal temperature changes reveals

an even greater trend in summer (5.5° per century) from 1914–1945, with no significant trend from 1874 to 1913, and again no periodicity. However, the author thinks he has found a cycle of 11 to 13 years recurrence of extremely warm summer, which should allow a forecast of a hot summer in 1958, 1959 or 1960. Winters show extreme variability with a slight general upward trend (1890–1945). *Subject Headings:* **1. Temperature trends 2. Hot summers 3. Long range forecasting 4. Paris, France.**—*M.R.*

3.11–141 551.524.34

*Zoch, Richmond T., **The trend in temperature at Washington, D. C., for 1862–1949.** *Washington Academy of Sciences, Journal*, 40(11):348–350, Nov. 15, **1950.** 2 tables. **DLC**— The air temperature at Washington, D. C., recorded over a period of 87 years, was analyzed for evidence of a temperature trend. The year was divided into 36 periods of 11 days each; means of temperature were calculated for each year and a regression coefficient was calculated for each decade in order to determine the existence of any relationship between temperature and time. Eighteen of the regression coefficients were significant and eighteen were not significant but all 36 regression coefficients were positive. Hence, the climate of Washington is getting warmer. *Subject Headings:* **1. Temperature trends 2. Washington, D. C.**—*I.L.D.*

3.11–142 551.524.37

*Ambrosetti, Fl., **Le condizioni del gelo al margine meridionale delle Alpi.** [Frost conditions on the southern slope of the Alps.] *Geofisica Pura e Applicata*, 22(1/2):108–127, Jan./March **1952.** 16 tables, 6 refs. English, French and German summaries p. 108. **MH-BH**— Data for 50 years (1900–1949) for Milan, Lugano, Bellinzona and Locarno-Muralto are analyzed to show frost conditions on the south slope of the Alps, and these conditions are compared with those prevailing at Zurich and Basel on the north slope. The analytical tables (and discussion) cover the factors of mean and extreme number of days with frost, first and last frost, number of days with temperature near (but above) freezing, <0°, <1° and <2°C, length of period with and without danger of frost, frequency of various degrees of frost, lowest temperature during months with frost danger, and sum of degrees below freezing (minimum degree days) by months and for the year. Number of consecutive days with frost are also tabulated for Lugano and Muralto. Of course the most severe conditions are found at Basel and Zurich, the least severe at Muralto and Milan; the latter stations having only half as many freezing days a year as the former. *Subject Headings:* **1. Frost frequencies 2. Minimum temperatures 3. Orographic effects 4. Po Valley, Italy 5. Switzerland 6. Alps.**—*M.R.*

3.11–143 551.524.7:551.510.52/3

Bannon, J. K., **Classification of temperatures in the upper troposphere and lower stratosphere according to tropopause pressure.** *Great Britain. Meteorological Research Committee, M.R.P.*, 731, May 27, **1952.** Mimeographed. 12 p. 8 figs., 5 tables, 13 refs. **DAWS**— Both upper air temperature and tropopause pressure (Pc) are functions of advection and vertical motion. For 20 mb steps of Pc, mean pressure-temperature curves 500–100 mb are drawn for Larkhill (England) in Jan., April, July and Oct. 1948–1950. Lapse rates are discussed and causes of variation examined, and several significant correlations found. A high mean lapse rate in lower stratosphere in autumn is related to the autumn minimum of ozone. Suggestions are made for future investigation. *Subject Headings:* **1. Upper air temperatures 2. Tropopause height 3. Larkhill, Eng.**—*C.E.P.B.*

SOIL TEMPERATURE

3.11–144 551.525.2

Dirmhirn, Inge, **Oberflächentemperaturen der Gesteine im Hochgebirge.** [Surface temperatures of rocks in high mountains.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, 4(1):43–50, **1952.** 2 figs., table, 8 refs. German, English, French summaries p. 43–44. **DWB** Diurnal variation of surface temperature of a plate of gneiss 6 cm thick, exposed horizontally at 3050 m on Sonnblick on Aug. 29–30 and Sept. 6–7, 1951 (cloudless sky), showed variation from 29 to −4°C. Other observations show a rapid decrease of

daily range with increasing wind speed and with increasing cloud. *Subject Headings:* **1. Surface temperatures 2. Sonnblick, Austria.**—*C.E.P.B.*

3.11–145 551.525.4:551.584.3

Grunow, Johannes, **Beiträge zum Hangklima.** [Contributions to slope climate.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 35:293–298, **1952.** 7 figs., 2 tables, 9 refs. **MH-BH**—Observations of earth temperature at 2–100 cm depth on south and north slopes on Hohenpeissenberg are compared and the differences related to differences of radiation and the effect of the slope on winds, precipitation and evaporation, and thereby on soil conductivity. These define the plant climate. *Subject Headings:* **1. Earth temperatures 2. Topographic effects.**—*C.E.P.B.*

3.11–146 551.525.5:551.588.2

Nikitin, P. N., **Vechnaia merzlota gory Razvalki.** [Permafrost on Razvalka Mountain.] *Priroda*, Moscow, 40(9):44–46, Sept. **1951.** fig., table, 5 refs. **MH-BH**—Permafrost in soil was found in 1902 by EIKHEL'MAN on Razvalka Mountain, 390 m high and 1.5 km from the city of Zheleznovodsk. Other investigators also paid attention to this phenomenon. GEORGIEVSKIĬ, (*see Meteorologiia i Gidrologiia*, No. 7–8, 1939) carried out special soil temperature observations in this region and discovered permafrost at depths from 0.8 to 4.6 m. The author describes differences found in various parts of the mountain and discusses the causes of this permafrost formation. The most probable factor affecting permafrost in this locality is the carbon dioxide in solid or fluid state coming from the younger formations being evaporated and transferred into the higher soil layers. *Subject Headings:* **1. Permafrost 2. Chemical effects 3. Razvalka Mountain, Caucasus 4. U.S.S.R.**—*N.T.Z.*

ATMOSPHERIC PRESSURE AND WIND

PRESSURE

(*See also items:* 3.11–76, 3.11–79, 3.11–81, 3.11–100, 3.11–166)

3.11–147 551.541:550.34

Press, Frank and Ewing, Maurice, **Ground roll coupling to atmospheric compressional waves.** *Geophysics*, Menasha, Wisconsin, 16:416–430, July **1951.** graphs, refs., eqs. **DWB**—The theory of ground roll associated with air waves is outlined and previous works are cited. Experimental data obtained from blasts in the air above the ground and in holes agree with theory, in that coupling occurs when surface waves have a phase velocity equal to the speed of sound in air. When velocities differ (<speed of sound), peculiar seismograph traces are recorded. The effect of elevation of shot is shown by comparison of traces for different elevations, indicating that the character of the ground roll record does not change for shots up to 30 ft. *Subject Headings:* **1. Air coupled waves 2. Seismology.**—*M.R.*

3.11–148 551.543:551.515.21:551.588.2(267)

§Frolow, Serge, **Les composantes du champ de pression de l'Océan Indien sud-ouest et leurs correlations.** [The components of the field of pressure in the southwest Indian Ocean and their correlations.] *Madagascar. Service Météorologique, Publication*, No. 15, June **1949.** 74 p. 18 plates, 16 refs. **DWB**—A remarkably profound study of the effect of the pressure field in the vicinity of Madagascar on the formation of cyclones, hurricanes and other storms; the correlation thereof with cloudiness, rainfall, thunderstorm frequency and local winds in Madagascar; and the local orographic effects on both the pressure field and on the incident storms and weather. A marked difference is found between the meteorology of this area and that of the Lesser Antilles. Rapidly developing and slowly developing baric systems are considered separately from a synoptic and dynamic point of view. *Subject Headings:* **1. Cyclogenesis 2. Dynamics of the atmosphere 3. Madagascar 4. Southwest Indian Ocean. I. Madagascar. Service Météorologique.**—*M.R.*

3.11–149 551.543.2:551.585

Dagnino, Ignazio (*Inst. Geof. e Geod. Univ. di Genova*), **Sull'andamento annuo della pressione atmosferica nel Mediterraneo.** [Annual variations of atmospheric pressure in the Mediterranean area.] *Geofisica Pura e Applicata*, 21:43–48, **1952.** fig., table, eqs., 6 refs. Italian and English summaries p. 43. **MH-BH**—"The first three harmonic components of the annual variation of the atmospheric pressure have been calculated" from monthly averages at 52 locations in the region. It is concluded that the Mediterranean can logically be divided into five climatic regions. *Subject Headings:* **1. Pressure variations 2. Climatic regions 3. Mediterranean Area.**—*M.P.K.*

WIND

(*See also items:* 3.11–34, 3.11–44, 3.11–54, 3.11–95, 3.11–104, 3.11–116, 3.11–120, 3.11–268, 3.11–272 *and* Special Bibliography on Flight Turbulence, P. 1135)

3.11–150 551.551.2

Knighting, E., **Random motion and atmospheric turbulence.** *Great Britain. Meteorological Research Committee, M.R.P.*, 728, April 16, **1952.** Mimeographed. 8 p. ref., 33 eqs. **DAWS**—The turbulent motion of marked particles from a point source is compared to random walks of a cluster. As the cluster spreads, larger eddies take effect and the steps are made with increasing velocities. Mathematical discussion leads to the conclusion that turbulence is characterized by this "law of step size." *Subject Heading:* **1. Turbulence theory.**—*C.E.P.B.*

3.11–151 551.553.21

Heyer, Ernst, **Über den Monsun.** [On the monsoon.] *Zeitschrift für Meteorologie*, 6(2):38–40, Feb. **1952.** 6 refs. **MH-BH**—A summary of the paper of S. P. Khromov (*see item* 10–109, Oct. 1950, *MAB.*) Monsoons are considered either a special form of the trade wind circulation or a cyclonic activity and are not merely the result of the thermal contrast between land and water. A numerical definition of monsoons in terms of frequency of wind direction during Jan. and July is set up and is used to describe the geographical distribution of monsoons. *Subject Heading:* **1. Monsoons.**—*I.L.D.*

3.11–152 551.555.4:551.553.8:551.558.21

§Rougetet, E., **Bourrasques de mistral sur le littoral varois.** [Mistral storms on the Var coast.] *La Météorologie*, 4th Ser., No. 24:259–268, Oct./Dec. **1951.** 9 figs., 2 refs. French, English and Spanish summaries p. 259. **DWB**—A thorough synoptic analysis of a situation which occurred in southern France on Jan. 15 and 18, 1951. Surface, upper level, frontal movement and isallobaric charts are presented and the local effects at a number of Var stations (Toulon, Nice, Marignane, Saint-Raphaël) cited in detail. The analysis shows that the air masses are dammed up against the mountain barriers until they spill over with violent accelerations and resulting vertical and horizontal eddies and turbulence. *Subject Headings:* **1. Mistral storms 2. Synoptic studies 3. Atmospheric turbulence 4. Orographic effects 5. Var coast, France.**—*M.R.*

3.11–153 551.555.4:551.551:551.515.8(45)

De Pasquale, Oreste (*Messina Aeron. Met. Observ.*), **Contributo allo studio dei bacini retromontani o retrofrontali, contenenti aria fredda, che producono venti catabatici con groppi o colpi di vento.** [Contribution to the study of pools of cold air which lie beyond mountain ranges or fronts that give rise to squalls or gusty winds.] *Rivista di Meteorologia Aeronautica*, Rome, 11(2):19–22, April/June **1951.** 2 refs., eqs. Italian, French, English and German summaries p. 19. **MH-BH**—The hydrodynamic explanation of gusts and squalls according to Oddone (1935) is set forth, and applied to the case of a basin of cold air between mountains or fronts, which, according to this theory, is analogous to seiches in a lake basin. The formula can be used to calculate the thickness of a cold air mass lying beyond a range or front. *Subject Headings:* **1. Hydrodynamics 2. Squalls 3. Gustiness 4. Katabatic winds 5. Cold air sinks 6. Italy. I. Oddone, —.**—*M.R.*

3.11–154 551.556:551.465(27)(261)

*Pequegnat, Frederick C., Woods Hole Oceanographic Inst.) **Annual variations in current speeds in the Gulf Stream system.** *Journal of Marine Research*, New Haven, Conn., 10(1): 38–47, 1951. graphs, table, refs. Also issued as *Woods Hole Oceanographic Institution, Contribution No. 557.* DWB—Analysis of Hydrographic Office current observations of 10 segments of Gulf Stream shows marked annual variations in speed in all areas. Graphs of monthly resultant current speeds show the maximum occurring during summer in the southern areas and during winter in the northern. Fall is the season of minimum current speeds throughout the system. Direct correlation is found between current speed and wind velocity in the Florida Straits while weak area and partial correlation between current speed and sea level in Mona and Chesapeake. [Subject Headings: 1. Gulf Stream speeds 2. Ocean current speeds 3. Wind driven currents 4. Atlantic Ocean. I. Woods Hole Oceanographic Institution.—*M.P.K.*

3.11–155 551.556:69

Kiyoki, Isamu (Bldg. Res. Inst., Tokyo) **Mathematical analysis method for wind pressure distribution of structures.** [1952?] 16 p. diagrs. eqs. Mimeographed. DWB—Models are set up and mathematical values combined graphically with experimental data for wind pressure distribution on the windward side of houses (with eaves without eaves and for roofs having a curved surface) and on other surfaces of similar houses. The method is shown to be applicable and graphical methods are being devised to facilitate the mathematical computations. Characteristics of turbulence are taken into account in the models. [Subject Headings: 1. Wind load on structures 2. Turbulent flow.—*M.P.*

3.11–156 551.556:69

Kiyoki, Isamu (Bldg. Res. Inst., Tokyo) **Studies on wind pressure of buildings against natural wind.** [1953?] 17p.+15p. figs. Mimeographed. DWB—The prevailing directions of storm winds (typhoon and extratropical cyclones) at numerous places in Japan were determined and are shown in a chart. The frequency of wind of certain force and duration from all directions is also analyzed. Most typhoon and storm winds are S or SW except in N portion and in some peculiar topographic localities. Twenty years of record were used. Photographical recording of wind load (pressure) on buildings and other barriers whose placement in the wind is varied. Deformations of wooden structures are due to pressure and vibration due to turbulence. Sometimes greatness does not conform to prevailing wind. Studies were made in wind and in wind tunnels. Influence of neighboring houses and of shape of ground or topography on a unit of weight of roof itself and of height is also considered. [Subject Headings: 1. Wind load on structures 2. Winds 3. Wind profiles 4. Local turbulence 5. Japan.—*M.P.*

3.11–157 551.556

Munk, Walter and Munk, Walter. **The effect of winds and tides on the length of the day.** *Tellus*, 3(3):217–221, Aug. 1951. fig., table, 9 refs. eqs. MH-BH—The seasonal variations in the zonal winds of the atmosphere are re-examined and estimated to account for a Jan. to July change of 0.5 milliseconds in the length of the day. Thus only one-third of the change in length of the day reported by the astronomers is explained by angular momentum transfers between the earth and atmosphere. The corresponding effect of the varying equilibrium body tide of the earth caused by changes in the sun's distance and longitude is negligible. [Subject Headings: 1. Wind effects 2. Tides 3. Length of day.—*Authors' abstract*]

3.11–158 551.556:551.465

Wittich, Klaus. **Der Einfluss des Windes auf die Wasserbewegungen durch die Strasse von Dover.** [The influence of the wind on the flow of water through the Straits of Dover.] *Deutsche Hydrographische Zeitschrift*, Hamburg, 5(1): 21–37, 1952. 8 figs., table, 7 refs. German; English and French summaries p. 31–32. DWB—The relation between winds and resultant surface currents at the Lightship "Varne" (50°54'N, 1°17'E) for 1926–48 is investigated. A current wind rose is drawn from 3-day means and an isoline diagram showing direction and speed of monthly resultant currents in relation to winds. Drift component is in

direction N 19°E is related to SW wind component w by $v=2.9+0.016w$; v and w in cm/sec. The winds and currents are also related to salinity changes. *Subject Headings:* **1. Wind driven currents 2. Straits of Dover.**—*C.E.P.B.*

3.11–159 551.556.26.1:63

KHromov, S. P., **Voprosy gidrometeorologicheskoĭ effektivnosti polezashchitnogo lesorazvedeniia. Pod red. N. A. Bagrova.** [Hydrometeorological problems of the effectiveness of shelter belts. Edited by N. A. Bagrov.] *Vsesoiuznoe Geograficheskoe Obshchestvo, SSSR, Izvestiia*, 83(6):656–659, Nov./Dec. **1951.** ref. **DLC**—KHromov reviews of a collection of papers on the effect of shelter belts upon climate, especially on precipitation, and the methods and principles of shelter belt construction. The effect of forest strips upon precipitation is discussed by K. P. KASHIN, and KH. P. POGOSIAN, M. I. BUDYKO and O. A. DROZDOV; the latter presents a method for determining the possible effect of shelter belts upon evaporation and increase of rainfall in the steppe zone. S. A. SAPOZHNIKOVA discusses the moisture conditions in the semi-arid zone of the Prikaspian depression and A. P. KONSTANTINOV discusses the influence of forest strip upon wind and turbulent exchange in the air layer near the ground. *Subject Headings:* **1. Shelter belts 2. Climatic amelioration 3. Agricultural meteorology. I. Bagrov, N. A.** (*ed.*).—*I.L.D.*

3.11–160 551.556.3:621.311:621.396.67

Antennentürme mit Windkraftwerken. [Wireless masts with wind power machinery.] *Umschau*, 52(13):392, July 1, **1952.** 2 figs. **DLC**—Proposes the erection of wind electric generators (blades or rotors) on ultra-short-wave masts, which are often on high peaks. These supply power for the transmissions. *Subject Heading:* **1. Wind generators.**—*C.E.P.B.*

3.11–161 551.556.3:621.311.24

Thomas, Percy H., **Wind power.** *Water Power*, London, 3:302–306, Aug. **1951.** 2 figs., 3 tables.—Discusses practical aspects of aerogenerators used in conjunction with water power. *Subject Heading:* **1. Wind utilization.**—*C.E.P.B.*

3.11–162 551.556.4:551.586:581.9(98)

Tikhomirov, B. A., **O roli vetra v rasprostranenii rasteniĭ na kraĭnem severe.** [On the role of the wind in distribution of plants in the extreme North.] *Priroda*, Moscow, 40(8):23–25, Aug. **1951.** 4 refs. **DLC**—From five experimental plots, each 100 m², a five cm layer of snow was removed and the contents were examined for plant residues. The species to which belong the various seeds, leaves, stems, fruits, etc. that were found, are listed. The evidence indicates that the floral character of the far north is complemented by migrants from the south with the aid of southerly winds. *Subject Headings:* **1. Wind effects 2. Plant migrations 3. Plant ecology 4. Aerobiology 5. Soviet Arctic**—*I.L.D.*

3.11–163 551.557.2:656.7

du Jonchay, Ivan (*Champagne au Mont d'Or; Comité Français de Géodésie et Géophysique*), **L'importance des vents portants en altitude notamment dans l'hémisphère sud.** [Importance of upper air winds in the Southern Hemisphere.] *Geofisica Pura e Applicata*, 21:52–57, **1952.** 2 figs. English summary p. 52. **MH-BH**—It is suggested that a network of upper air stations is important for the Southern as well as the Northern Hemisphere, especially since the preferred high level air route from Europe to Australia will be via South Africa and the Kergulen Islands rather than via India. A westerly "jet stream" is present in those (30°–40°S) latitudes, but not much information is available thereon. Author suggests doing for air navigation (3 dimensions) what M. F. MAURY did for marine navigation (in 2 dimensions) a century ago, namely, to plot preferred air routes based on climatic (upper wind) data. Cirrus observations should play an important part in this program. *Subject Headings:* **1. Upper air winds 2. Jet stream 3. Aeronautical meteorology 4. Southern Hemisphere.**—*M.R.*

3.11–164 551.557.3:551.506.5(264)

Kuhlbrodt, Erich (*Dir. of Div. of Maritime Met., Met. Amt. für NW—Deutschland*), **Höhenwinde auf dem Seeweg Kapverdenregion—La Plata.** [Upper air winds on the ocean

route between Cape Verde—La Plata.] *Geofisica Pura e Applicata*, 21:19–31, 1952. 4 figs., 8 tables, refs. Summary in German and English p. 19. **MH-BH** Some partial results of analysis of upper air data, collected by the German "Meteor" Expedition and the Deutsche Seewarte, are presented to illustrate the general air circulation on the route to South America. Average wind elements and dispersion of velocities are treated for the 4–5, 9–10 and 14–15 km levels. Air current stratification up to 15 km is given with particular attention to the seasonal characteristics of the tropical easterlies and the tropical west-wind layer of the upper troposphere. *Subject Headings:* **1. Marine meteorology 2. Upper air winds 3. "Meteor" Expedition 4. South Atlantic Ocean.**—*M.P.K.*

3.11–165 551.557.32(53)

Austin, Elaine, **Upper winds of Aden.** *Great Britain. Meteorological Research Committee, M.R.P.*, 729 (revised) July 1952. Mimeographed. 3 p. 5 figs., table, ref. **DAWS**—Radar winds at Aden, Aug. 1948–Dec. 1950, are summarized for levels of 900 to 100 or 60 mb and discussed. Points noted include sharp transition from westerlies to easterlies at 200 mb in May and back to westerlies in Oct., and persistent easterlies in July (55 knots at 100 mb). An addendum by C. S. Durst gives winds between Cairo and Entebbe in July 1951. *Subject Headings:* **1. Upper air wind frequencies 2. Aden, Arabia.**—*C.E.P.B.*

3.11–166 551.558:551.547

Weber, Siegfried, **Studie über Vertikalgeschwindigkeiten in der hohen Troposphäre innerhalb starker Windfelder.** [Studies on vertical velocities in the high troposphere inside strong wind fields.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 35:124–132, 1952. 6 figs., table, eqs., 12 refs. German and English summaries p. 124. **MH-BH**—The methods of J. C. Bellamy and H. A. Panofsky for calculating vertical velocities from the pressure field and horizontal wind gradient were applied to occasions of strong winds in upper troposphere over British zone of Germany, and England. Results were unconvincing; sources of error may be neglect of density changes, errors of wind measurement and short-period oscillations. *Subject Headings:* **1. Vertical velocity 2. Wind computation.**—*C.E.P.B.*

AQUEOUS VAPOR AND HYDROMETEORS

WATER VAPOR AND CLOUD PHYSICS

(*See also items:* 3.11–1, 3.11–4, 3.11–5, 3.11–57, 3.11–62 to 3.11–64, 3.11–66, 3.11–67, 3.11–208)

3.11–167 551.524.4(26) 551.571.4(26)

*Darlington, C. R., **The variation of humidity with height over the ocean.** *Great Britain. Meteorological Research Committee, M.R.P.*, 725, May 12, 1952. Mimeographed. 4 p. 14 figs., 2 tables, 4 refs., 3 eqs.—During cruises in Arctic and northern waters and in SW North Atlantic numerous observations of dry and wet bulb temperature were made at 0–30 ft above sea. These are set out in detail with associated wind and weather. Mean profiles of temperature and vapor pressure are shown graphically. The theory of evaporation is set out and Montgomery's "evaporation coefficient" and rate of evaporation are calculated for unstable and stable, rough and smooth conditions, from vapor pressure at 0 and 20 ft. Results are erratic but in general agreement with theory. *Subject Headings:* **1. Humidity lapse rate 2. Vertical temperature gradient 3. Marine meteorological data 4. Arctic 5. North Atlantic.** —*C.E.P.B.*

3.11–168 551.571.4(261)

Durst, C. S. and Gordon, A. H., **Some observations of vertical temperature and humidity gradients made from ocean weather ships.** *Great Britain. Meteorological Research Committee, M.R.P.*, 714, Feb. 22, 1952. Mimeographed. 4 p. 2 figs., table, 4 refs.—Psychrometer observations in May–Sept. 1951 at JIG (52½°N, 20°W) and ITEM (59°N, 19°W), 0–50 ft above sea surface are tabulated and vertical gradient of dew point compared with sea temperature, wind and weather. *Subject Headings:* **1. Humidity lapse rate 2. Weather Ship "JIG" 3. Weather Ship "ITEM" 4. North Atlantic Ocean.**—*C.E.P.B.*

3.11–169 551.571.4 551.524.4 551.584

†Vieser, Walter, **Temperatur- und Feuchtigkeitsverhältnisse in bodennahen Luftschichten.** [Temperature and humidity conditions in the air layers near the ground.] *Beiträge zur naturkundlichen Forschung in Südwestdeutschland*, Karlesruhe, 10:3–34, **1951.** 28 figs., 71 refs.—Temperatures and humidities over and in sand, grass, asphalt, snow and water at Karlsruhe were measured with temperature elements from 20 cm below to 70 cm above surface, and vapor pressure and relative humidity with small hygrometers up to 60 cm above. The results are discussed in detail and related to weather type and season. Characteristic types of vapor pressure distribution are related to austausch. Over grass the maximum temperature and humidity are found at the top of the stems, on bare soil at the surface. The limit of the effect of water was found at 25–30 cm above the surface; lake fogs rarely exceeded this height. *Subject Heading:* **1. Microclimatology.**—*C.E.P.B.*

3.11–170 551.573

Atanasiu, N., **Die Wasserversorgung unserer Kulturpflanzen in Abhängigkeit von Klima und Boden.** [The dependence of the water supply of our crops upon climate and soil.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 32:9–13, **1952.** 3 figs., 6 tables, 4 refs. **DWB**—Experiments show that absolute water need of plants is independent of soil type and yield. The absolute or maximum water need is distinguished from relative need, which is sufficient for an average yield, and from actual water use. The actual water need generally depends on saturation deficit, wind and development phase of the plant; it is less in the beginning and at the end of development. *Subject Headings:* **1. Evapotranspiration 2. Bioclimatology.**—*A.A.*

3.11–171 551.573:551.588.6

Budyko, M. I., **K teorii isparenïia s pochvy, pokrytoï rastitel'nost'iu.** [Contribution to the theory of evaporation from soil with vegetation.] *U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby. Trudy, Naucho-issledovantel'skikh Uchrezhdeniĭ, Ser. 1, Meteorologiia*, No. 34, p. 18–24, **1946.** 6 refs., 7 equations. **DLC**—The author uses the theory of the mean value of evaporation by means of the coefficient of turbulent exchange to establish the probable dependence of evaporation from a soil surface covered with vegetation upon the height of the vegetation. The suggested formula shows that evaporation from soil covered with vegetation 10 cm high is 70% and from the surface of grass 33% of the total evaporation. If the grass cover is 20 cm high the relationship will be approximately 50% and 50%. These theoretical computations were corroborated by experimental observations, as well as by the fact that the low and unevaporating grass cover 15 cm high reduces by 50% the rate of evaporation from the soil. *Subject Headings:* **1. Evaporation theory 2. Soil evaporation 3. Vegetative influences.**—*N.T.Z.*

3.11–172 551.573

Čadež, M., **O toploti isparavanja.** [On the heat of vaporization.] *Yugoslavia. Hidrometeorološka Služba, Hidrometeorološki Glasnik*, 3:19–25, **1950.** 5 refs., eqs. In Croatian, French summary p. 25. **DWB**—The heat of vaporization of water is determined from a theoretical approach. Equations accounting for internal and external heat (the former equivalent to the power of cohesion of water molecules, the latter required to create an expansion of water under external pressure) necessary to effect evaporation under a given pressure and temperature are developed and commented on. *Subject Headings:* **1. Evaporation theory 2. Heat of vaporization.**—*G.T.*

3.11–173 551.573

Neubauer, H. F., **Beobachtungen über die Verdunstungsgrösse in Afghanistan.** [Observations on magnitude of evaporation in Afghanistan.] *Wetter und Leben*, 4(1/2):18–24, Feb. **1952.** 2 figs., 3 tables. **MH-BH**—Approximately hourly measurements of evaporation were made over a period of 60 days in Afghanistan using a Piché evaporimeter with white filter paper. Tables giving maximum evaporation, intensities and attendant conditions, a comparison of evaporation intensities among various areas in Afghanistan and mean daily values of evaporation intensity at Kabul over various surfaces, and graphs showing daily march of

evaporation on specific days are presented. The highest evaporation occurred between 1230 and 1400h at height of 2 to 3 cm. *Subject Headings:* **1. Evaporation measurements 2. Micrometeorology. 3. Afghanistan.**—*I.L.D.*

3.11–174 551.573:551.585

†Schulze, Alfred, **Das Verdunstungsproblem im Rahmen der Klimaklassifikation.** [The evaporation problem in the sphere of climatic classification.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 35:179–182, **1952.** eqs., 22 refs. **MH-BH**—Evaporation is an important element in classifying climate but direct measurement is difficult. The various approximation methods for evaporation or "dryness index" are summarized. *Subject Headings:* **1. Evaporation 2. Climatic indexes.**—*C.E.P.B.*

3.11–175 551.574.1

Facy, L. (*Paris*), **Éclatement des lames minces et noyaux de condensation.** [Bursting of thin films and condensation nuclei.] *Journal Scientifique de la Météorologie*, 3(11):86–98, July–Sept., **1951.** 2 figs. **DWB**—Electron microscope analysis of sea spray obtained when bubbles burst, reveals the composition of condensation nuclei in different size ranges, as well as the relative and absolute nuclei size distribution. Mechanics of formation and bursting of bubbles or films, of collecting and photographing and, finally, of analysis are described and illustrated. Theory of drop shattering is treated in detail and natural description compared with description of artificially produced films in the laboratory. Many excellent photomicrographs are reproduced. Conclusion is that bursting produces numerous liquid drops between 10^{-2} and 10^{-3} cm composed of $MgCl_2$, with relatively few NaCl nuclei in the lower range. Between 10^{-4} and 10^{-3} the nuclei are nearly always surrounded by $MgCl_2$, with sometimes NaCl and more rarely with sulfates or carbonates of Na or Mg as nuclei. It is estimated that the rate of sea salt nuclei production on the earth is $10^5/cm^2/sec$. *Subject Headings:* **1. Condensation nuclei 2. Saline nuclei 3. Photomicrographs.**—*M.R.*

3.11–176 551.574.1

Junge, Chr., **Bemerkungen zur Frage der Eiskeimbildung im frostübersättigten Bereich.** [Remarks on formation of ice nuclei in the frost-supersaturated region.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 5(1):44–55, **1952.** 3 figs., 3 tables, 10 refs. German, English and French summaries p. 44–45. **DWB**—Author attempts to bring the modern theories of the operation of freezing nuclei into accord with the observed fact that most condensation nuclei are partly soluble and partly insoluble. He suggests that nuclei are only effective in dilute solutions, and distinguishes between those used in the condensation process and smaller ones which are not (FINDEISEN's types I and II). *Subject Heading:* **1. Freezing nuclei.**—*C.E.P.B.*

3.11–177 551.574.1

Junge, Chr., **Gesetzmässigkeiten in der Grössenverteilung atmosphärischer Aerosole über dem Kontinent.** [Regularities in the large scale distribution of atmospheric aerosols over the continent.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 35:261–277, **1952.** 13 figs., 10 tables, eqs., 13 refs. **MH-BH**—Various measurements of diameter of natural aerosols are combined in diagrams and classified. Measurements at Frankfurt a/M. are then analyzed, and origin 24 and 48 hours previously marked from air paths. Sizes of particles from combustion of various materials show a rough cubic law and their combination in town smoke and coagulation increase the agreement. This distribution explains many features of visibility in haze. *Subject Heading:* **1. Aerosols.**—*C.E.P.B.*

3.11–178 551.574.1

Kachalsky, E., **The kinetics of phase formation.** (In: Israel. Rainfall Research Committee, **Symposium on artificial rain.** Hakirya, Aug. **1951.** p. 7–18, 4 figs., 8 refs., eqs.) In Hebrew, English summary p. 7–8. **DWB**—The principles of the kinetic theory of phase transition, which is of fundamental importance in understanding the condensation and sublimation processes of atmospheric water vapor in the formation of clouds are discussed. The constructions of VOLMER, FARKAS, BECKER and FRENKEL are summarized. *Subject Headings:* **1. Condensation nuclei 2. Cloud formation.**—*I.L.D.*

3.11–179 551.574.1(083.3) 551.576.11:001.5

Kiveliovitch, M. and Roulleau, J., **Évolution des gouttes d'eau dans l'atmosphère (suite).** [Formation of drops of water in the atmosphere (con't).] *Journal Scientifique de la Météorologie*, 3(11):99–106, July–Sept., **1951.** 2 figs. **DWB**—Using the results of experiments made by KINZER and GUNN (1949 and 1951), the authors have tested their former theory of the *couche limite* and the theoretical formula $R = R_0 \sqrt{\frac{r}{r_0}\frac{u_0}{u}}$ with reasonable agreement between theory and measurement. The argument is not so good for the formula $\delta = \alpha T + \Delta$, where the growth of droplets as a function of time and temperature is considered, unless the temperature of the drop, the air and the dewpoint are within a range of 10°C or a relative humidity of >60%. (*See items* 7–84 and 2.9–118, July 1950 and Sept. 1951, respectively, *MAB*.) *Subject Headings:* **1. Cloud physics 2. Drop accretion.**—*M.R.*

3.11–180 551.574.1:551.578.11

Mason, B. J., **Production of rain and drizzle by coalescence in stratiform clouds.** *Royal Meteorological Society, Quarterly Journal*, 78(337):377–386, July **1952.** 4 figs., 14 eqs., 16 refs. **DWB**—Droplets originating on salt nuclei grow by condensation and coalescence, but shrink by evaporation before reaching the ground. Rates of these processes are calculated and it is found that stratiform clouds sustained by uniform updraft up to 10 cm/sec cannot produce drizzle at the ground. A mechanism is suggested in which most of the cloud droplets are thrown out by turbulence and evaporated but a few remain in the cloud for 3–4 hours and grow by coalescence into drizzle drops. An appendix treats turbulent diffusion of droplets as a random walk. *Subject Headings:* **1. Drizzle 2. Raindrop coalescence.**—*C.E.P.B.*

3.11–181 551.574.1:551.594.7

Neumann, J., **Radar in cloud research.** (In: Israel. Rainfall Research Committee, **Symposium on artificial rain.** Hakirya, Aug. **1951.** p. 40–47. 7 figs., 18 refs. In Hebrew, English summary, p. 12–13.) **DWB**—A discussion of RAYLEIGH's theory of the scattering of electromagnetic radiation by spherical particles and of its relevance to radar and the application of radar to cloud research, to cloud physics studies and to experiments on artificial rainfall. *Subject Headings:* **1. Cloud physics 2. Artificial precipitation 3. Radar.**—*I.L.D.*

3.11–182 551.574.1:551.508.91

Pollak, L. W. and Murphy, T., **Sampling of condensation nuclei by means of a mobile photo-electric counter.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 5(1):100–119, **1952.** 8 figs., 3 tables, 9 refs. English, German and French summaries p. 100–101. **DWB**—An improved photoelectric nuclei counter at the Dublin School of Cosmic Physics and equipment of a motor van as a mobile laboratory are described and the technique of observations during travel set out. Observations around Dublin and in 2 traverses of Ireland to W. coast are shown in tables and diagrams. Among the results were uniformity of nuclei distribution in polar air away from contamination and great variability (100 to 206,000/cc in 45 min) in showery weather with wind from the sea on W. coast. High concentrations at low tide are attributed to drying foreshore. *Subject Headings:* **1. Nuclei count 2. Nuclei counters.**—*C.E.P.B.*

3.11–183 551.574.1:551.577.11:551.501.81

Wexler, R., **Precipitation growth in stratiform clouds.** *Royal Meteorological Society, Quarterly Journal*, 78(337):363–371, July **1952.** 2 figs., 2 tables, 11 equations, 19 refs. **DWB**—The paper interprets the growth of ice crystals in stratiform clouds from radar observations by comparison with theoretical growth rates, using circular disks as models, and two cloud models. The masses and terminal velocities of ice crystals originating at 3 km in a water-saturated cloud are computed for different levels and compared with radar signal intensity. It is found that no liquid water exists at levels above −5°C; below the −3°C level coalescence of ice crystals occurs and a "coalescence function" is calculated as the ratio of the radar echo from snowflakes to that from individual crystals. *Subject Headings:* **1. Cloud physics 2. Precipitation formation 3. Radar precipitation echoes.**—*C.E.P.B.*

3.11–184 551.574.1

Woodstock, Alfred H., **Atmospheric salt particles and raindrops.** *Journal of Meteorology*, 9(3):200–212, June 1952. 16 figs., 7 tables, 31 refs. **MH-BH, DWB.** Also: Woods Hole Oceanographic Institution, Contract N6onr-27702(NR-082-021), Technical Report No. 14, Sept. 1951. 28 p. photos., diagrs., graphs, bibliog. **DWB**—Atmospheric sea salt data are presented in the form of distribution curves which show the number of sea salt particles (of a given weight range) sampled at different altitudes plotted against the weight. Computations show that "in the process of growth the droplets containing each salt particle grow to raindrop size through coalescence with much more numerous and relatively non-saline cloud droplets. The numbers of droplets in cumulus clouds over the sea are compared to the numbers of condensation nuclei in the sub-cloud layer and to the number of larger sea-salt particles." A method (of sampling the large sparsely-distributed salt particles in the atmosphere) is described briefly. *Subject Headings:* **1. Saline nuclei 2. Condensation nuclei 3. Raindrops. I. Woods Hole Oceanographic Institution II. Contract N6onr-27702 (NR-082-021).**—*M.P.K.*

3.11–185 551.574.7

Best, A. C., **Ice accretion in cirrus cloud.** *Great Britain. Meteorological Research Committee, M.R.P.*, 730, May 1, 1952. Mimeographed. 2 p.+appendix. fig., 4 refs.—Earlier observations of temperature of spontaneous freezing of water droplets of different sizes are summarized and suggest that at −50°C liquid drops must be of diameter 1μ or less. Three observations of icing in cirrus (one at −54°C), indicating liquid drops, are discussed. *Subject Heading:* **1. Icing of aircraft.**—*C.E.P.B.*

FOG AND CLOUDS

(*See also items:* 3.11–3, 3.11–4, 3.11–28, 3.11–64, 3.11–129, 3.11–179, 3.11–208, 3.11–270, 3.11–276)

3.11–186 551.575.36

*Čadež, M., **Nekoliko statističkih podataka o ljubljanskoj magli i periodi 1943–46.** [Statistical data on fog at Ljubljana during 1943–46.] *Yugoslavia. Hidrometeorološka Služba, Hidrometeorološki Glasnik*, 2(1–2):97–103, 1949. 6 tables. In Croatian. **DWB**—The "well-known Ljubliana fog" is called "one of the most characteristic weather phenomena" of the region. Definitions of various types of ground and "above-ground" fog are given and data on the frequency of each type presented and commented on. *Subject Headings:* **1. Fog 2. Fog frequencies 3. Ljubljana, Yugoslavia.**—*G.T.*

3.11–187 551.575.36

Tanaka, Bunji (*trans.*), **Fog in Korea and adjacent sea areas.** *U. S. Air Force, 2143 D Air Weather Wing Technical Bulletin*, 1(7):47–50, June 1951. 2 figs., 2 tables. **DWB**—This study on fog in Korea is from the U. S. Air Weather Service Tokyo Weather Central's "30 years meteorological records of Korea, 1936." The annual frequency of dense fog over inland Korea is about 20 days per year. The "sea fog" season begins in April and ends in August, it reaches a maximum in June and July. Data on the relations between beginning and disappearance of fog and the local time and wind direction are presented. *Subject Headings:* **1. Fog 2. Korea.**—*I.L.D.*

3.11–188 551.575.5:629.13

Fog at Bombay during February and March 1951. *Indian Journal of Meteorology and Geophysics*, 2(3):216, July 1951. **MH-BH**—Fog generally does not occur more than twice a year on the Santacruz Aerodrome near Bombay. Description of an unusual series of fog days is given. The lowest visibility reached was 10 yds. *Subject Headings:* **1. Fog frequencies 2. Airports 3. Aeronautical meteorology 4. Bombay, India.**—*A.A.*

3.11–189 551.576.1

Durst, C. S., **High level clouds in the tropics.** *Great Britain. Meteorological Research Committee, M.R.P.*, 727, May 12, 1952. Mimeographed. 1 p. fig., 4 photographs.—In

March 1952, during a flight from Khartum to Livingstone, continuous thin cirrus was observed between 10°40′N and 16°S, at 45,000–50,000 ft. Photographs are given. Cloud is attributed to ice needles from condensation in rising and spreading air near the equator. *Subject Headings:* **1. Cirrus clouds 2. Equatorial meteorology.**—*C.E.P.B.*

3.11–190 551.576.1:551.577.11

Sherman, L., **Photographs of the "complete precipitation" of a cumulus cloud.** *Tellus*, 3(3):203–204, Aug. **1951.** 3 figs., 4 refs. **MH-BH**—The photographs of "complete precipitation" of a cumulus cloud and the accompanying record of a sounding (temperature, elevation and relative humidity) taken in the Pacific in lat. 16.2 N and long. 152.8 W, confirm the observation of PALMER and ELSASSER that in low latitudes the entire cumulus cloud may precipitate and disappear and in the last stage precipitation falls from the clear sky. The cloud begins to show evidence of shear and then precipitation starts, and in the final stage its precipitation may be taken for cirrus. *Subject Headings:* **1. Cumulus clouds 2. Precipitation mechanism 3. Cloud photographs.**—*I.L.D.*

3.11–191 551.576.12:061.3

International Meteorological Organization. Committee for the Study of Clouds and Hydrometeors, **Première session, Paris, France, 22 Août-3 Septembre 1949. Procès-Verbaux.** Paris, Météorologie Nationale, [1950?] various paging. tables. Mimeographed. **MH-BH**—Transactions of sessions of the IMO. Committee on Clouds and Hydrometeors at Paris during 1949. M. VIAUT presided, and BERGERON, BLEEKER, DOUGLAS, DUFOUR, BENARTHUR HAYNES, MAURICE MÉZIN, BONNET and BEAUFILS participated. More precise definitions of clouds, thunderstorms, fog, haze, dust storms, tornadoes, etc. were attempted, with special emphasis on observations of these elements made from above or by airplane. These details are tabulated and presented in detail along with remarks by those present. *Subject Headings:* **1. IMO. Committee on Clouds and Hydrometeors 2. Cloud classification.**—*M.R.*

3.11–192 551.576.3

*Flach, Emil **Tages- und jahreszeitliche Besonderheiten im Verhalten der Bewölkung.** [Daily and annual peculiarities in the behavior of cloudiness.] *Zeitschrift für Meteorologie*, 6(1,2):1–8, 33–38, Jan., Feb. **1952.** 6 figs., 2 tables, 20 refs. **MH-BH**—Mean cloud amounts at Bad Elster for each day, 1930–39, for 7, 14 and 21h and changes 7–14h, 14–21h, 21–7h are shown by smoothed curves. A marked change in late Feb. begins the "austausch" phase, related to beginning of convection, decreased frequency of low inversions (300–2000 m) and end of winter; in late Oct. opposite changes initiate a "closed" phase. Decrease 14–21h and increase 21–7h are greatest in April and Sept., showing a 6-month oscillation with a 30-day wave superposed. Other German stations show similar variations. In Pt. 2 seasonal changes of diurnal variation are discussed in greater detail from 2-hourly means at Bad Elster and Potsdam, and a "climatological classification" of days by cloud at 7, 14 and 21h is proposed. *Subject Headings:* **1. Cloud variations 2. Bad Elster, Germany.**—*C.E.P.B.*

3.11–193 551.576.5:551.509.34

Narikawa, J., **Cloud observations in the upper level and its application to the forecasting service in Kyoto District.** *Journal of Meteorological Research*, Tokyo, 3(6):225–229, March **1951.** 8 figs., tables. In Japanese, English summary p. (15). **DWB**—From an analysis of two years' data of the convergence of upper level clouds, it is concluded that convergence from west to north is the precursor of rainy weather and from west to south is the precursor of clear weather. *Subject Headings:* **1. Upper level cloud observation 2. Forecasting techniques 3. Kyoto District, Japan.**—*From author's abstract.*

3.11–194 551.576.5:523.4

Witte, Bruno and Friel, Shirley, **Report on the results of photographic seeing measurements.** Harvard University, Contract No. W19-122-ac-17, Special Report No. 37, March 14, **1951.** 35 p. 24 figs., 11 refs. **DWB**—This report includes: (1) "A study of the behaviour of large scale cloud masses in the earth's atmosphere" by RALPH SHAPIRO, in which the author undertakes to picture the pattern and movement of cloud masses as they would appear if

viewed from other planets and to compare these to the behavior of bright and dark spots which can be observed on Jupiter; (2) "A quantitative study of bright and dark spots on Jupiter's surface" by the same author; and (3) "Direct photoelectric photometry" by HENRY L. GICLAS, an account of the continuation of research work previously reported (No. 5, 1950, Annual), presenting observation data on the brightness of Uranus and Neptune with special attention to the solar constant. *Subject Headings:* **1. Planetary atmospheres 2. Cloud movement 3. Astrophotography 4. Jupiter. I. Harvard University II. Contract W19-122-ac-17 III. Shapiro, Ralph IV. Giclas, Henry L.**—*G.T.*

PRECIPITATION

(*See also items:* 3.11–1, 3.11–42, 3.11–80, 3.11–89, 3.11–123, 3.11–183, 3.11–190, 3.11–212, 3.11–217, 3.11–246, 3.11–255)

3.11–195 551.577.1

Steinitz, G., **Problems of rain formation.** (In: Israel. Rainfall Research Committee, **Symposium on artificial rain.** Hakirya, Aug. **1951.** p. 19–23. 16 refs. In Hebrew, English summary p. 8–9.) **DWB**—The role of condensation in cloud particles in rain formations, collision and direct condensation as factors in rain formation and the BERGERON-FINDEISEN theory are discussed. *Subject Heading:* **1. Rain formation.**—*I.L.D.*

3.11–196 551.577.11

Schirmer, H., **Beitrag zum Mechanismus der Niederschläge.** [Contribution to the mechanism of precipitation.] *Meteorologische Rundschau*, 5(3–4):51–53, March–April **1952.** 3 figs., ref. **DWB**—On Aug. 21, 1947, heavy rain in Main valley fell in 2 parallel streaks. Both showers moved ESE, the northern at 16 km/hr, the southern at 40. *Subject Heading:* **1. Precipitation streaks.**—*C.E.P.B.*

3.11–197 551.577.3:551.515.42:551.508.85

Hudson, H. E., Jr., Stout, G. E. and Huff, F. A. (*Illinois State Water Survey Div. Urbana*), **Studies of thunderstorm rainfall with dense raingage networks and radar.** *Illinois. State Water Survey Division, Report of Investigation*, No. 13, **1952.** 30 p. 18 tables, 20 figs., 17 refs. **DWB** A three years' study of areal distribution and intensity of rainfall connected with thunderstorms is reported. Three rain gage networks were operated in Illinois between 1948 and 1950 on 5.2-, 95-, and 280-sq mi areas, each with different gage densities. Area-depth-duration relationships for each of the networks are represented in graphical form, analyzed and compared. Effects of gage density on measured rainfall amount and on mean error are investigated. The cellular structure of thunderstorms is described. The report includes an account of rainfall measurement made with an AN/APS-15 3-cm radar instrument installed at El Paso, Ill. Principles and methods of radar measurement are described and results discussed and compared with rain gage data. Radar equipment is believed to be of definite usefulness in measuring rainfall density and areal distribution. *Subject Headings:* **1. Thunderstorm rainfall 2. Rain intensities 3. Rainfall depth duration studies 4. Radar measurement.**—*G.T.*

3.11–198 551.577.3:551.588.2(497.1)

Jovanocić, Dragušin, **O odnosu padavina i nadmorske visine u slivu Neretve.** [On the dependence of amount of precipitation on altitude in the basin of the Neretva.] *Yugoslavia Hidrometeorološka Služba, Hidrometeorološki Glasnik*, 3:50–56, **1950.** In Serbian. 5 figs. **DWB**—The Neretva River in southwestern Yugoslavia (about 225 km long) flows mostly in a NNW direction then turns S to enter the Adriatic Sea. The hydrometeorological observations made during 1923–1939 and analyzed by the author show the increase of precipitation amounts with altitude. In the first (altitudes 0–200 m) and second (altitudes 200–400 m) regions, located in the valley of the river toward the sea, this increase is less pronounced but in the third (altitudes 600–1000 m) and fourth (altitudes up to 2067 m) areas this dependence is well developed and has a direct linear relation. The author also presents one graph of the annual variations of runoff for the period 1923–1940 in three parts of the river flow (for upper,

middle and lower parts of the river). *Subject Headings:* **1. Precipitation distribution 2. Topographic effects 3. River flow 4. Runoff 5. Yugoslavia.**—*N.T.Z.*

3.11–199 551.577.3:551.506.1(494)

*Switzerland. Meteorologische Zentralanstalt, **Ergebnisse der täglichen Niederschlagsmessungen auf den Meteorologischen und Regenmess-Stationen in der Schweiz, 1949.** [Daily precipitation measurement data of the Swiss Meteorological and Rainfall Network, 1949.] [1950?] 220 p. **MH-BH**—Daily precipitation amounts and frequencies for each month of 1949, from observations made at 123 first order and 294 rainfall stations in Switzerland, are given in extenso. Precipitation stations are arranged by river basins. Monthly and annual totals for each station are also given, followed by isohyetal charts showing total precipitation for 1949, for hydrologic year 1948/9 and percentage of normal for each, in as much detail as is possible for such a hilly country. Remarkable storms are mentioned also. *Subject Headings:* **1. Precipitation data 2. Yearbooks 3. Rainfall networks 4. Switzerland.**—*M.R.*

3.11–200 551.577.3:551.515.8(474.3)

Zhakov, S. I., **Ob issledovanii geograficheskikh osobennosteĭ proiskhozhdeniia atmosfernykh osadkov.** [Studies of the geographic characteristics of the sources of atmospheric precipitation.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Izvestiia*, 83(2):156–160, March/April **1951.** 5 refs. **DLC**—The geographic origin of the atmospheric moisture which gives rise to precipitation is investigated by determining the daily march of rainfall at given points over a sufficiently long period of time and by analyzing the development of the synoptic process and the nature of the air masses associated with the rainfall. This approach and its possible shortcomings are described and it is applied to analysis of the source of moisture of the rainfall in Latvia. In eastern Latvia 90 percent of the annual and 85 percent of the summer precipitation is due to fronts and cyclones. The polar front and moisture from southern air masses, especially continental, tropical and warm continental polar air are important sources of rainfall. Maritime polar air is of lesser importance. *Subject Headings:* **1. Precipitation sources 2. Precipitation variations 3. Synoptic climatology 4. Latvia.**—*I.L.D.*

3.11–201 551.577.32:551.577.37

Schreyer, R. (*Vienna*), **Tageshöchstmengen des Niederschlags auf der Hohen Warte in Wien.** [Maximum diurnal precipitation at Hohe Warte, Vienna.] *Wetter und Leben*, Vienna, 3(11/12):266, Dec. **1951. MH-BH**—The third highest 24-hour rainfall recorded since 1891 occurred on May 10, 1951, and it amounted to 92.8 mm. Diurnal rainfalls exceeding 45 mm during the first half of this century and the dates of their occurrence are tested. It is found that the annual maximum never occurred in January and March. In December it occurred once, in February twice, in Oct. and Nov. 3 times, in April and Aug. 4 times, in June 5 times, in Sept. 6 times, in May 9 times and in July 13 times. *Subject Headings:* **1. Diurnal precipitation variations 2. Maximum rainfall 3. Vienna, Austria.** *I.L.D.*

3.11–202 551.577.33:551.590.22

Mineur, Henri, **Recherche d'une influence possible de la lune sur les précipitations atmosphériques.** [Research on the influence of the moon on atmospheric precipitation.] *Académie des Sciences, Paris, Comptes Rendus*, 233(23):1426–1428, **1951.** 2 figs. **DWB** Using the method of M. and Mme. Labrouste, an attempt is made to correlate the daily precipitation, the probability of a day without precipitation, or the average daily amount of precipitation on days when rain fell with the lunar cycle, using 75 years (800 moons) of record from (1) Clermont-Ferrand, (2) Parc Saint-Maur, (3) Nantes and (4) Algiers. At (1) no lunar effect was detected, at (2) and (3) there was a maximum on the 3rd and 18th day of the cycle, whereas at (4) the minimum was on the 4th and 24th, and the maximum on the 15th and 29th day. Graphs show the data and cycle for (2) and (3). *Subject Headings:* **1. Lunar influences 2. Precipitation variations 3. France 4. Algeria.**—*M.R.*

3.11–203 551.577.34(436)

*Steinhauser, Ferdinand (*Vienna*), **Der Jahresgang der Niederschlagswahrscheinlichkeit auf dem Sonnblick, 3106 m.** [Seasonal variation of precipitation probability on the Sonnblick

3106 m.] *Sonnblick-Verein, Vienna, Jahresbericht*, 48:18 24, **1950.** 2 figs., 3 tables. Monthly and daily rainfall probabilities (%) based on annual means for the period 1891 1950 are tabulated. Days with probabilities more than 5 units above or below the monthly mean probability are listed and discussed. Variations in rainfall probability within the year are represented by curves for the periods 1891–1950, 1891 1920 and 1921–1950. It is found that the latter period shows a marked decrease in precipitation probability during the late winter and early spring. Secular changes in rainfall probability on the Sonnblick, the Zugspitze and the Obir are represented by comparative curves for the period 1891–1950 and their climatological explanation is sought. *Subject Headings:* **1. Precipitation probability 2. Seasonal precipitation variations 3. Long period records 4. Sonnblick Observatory, Austria.**—*G.T.*

3.11–204 551.577.38(931)

*Bondy, F. (*Met. Office, Air Dept., Wellington*), **Droughts in New Zealand.** *New Zealand Journal of Science and Technology, Sec. B.*, 32(2):1–10, Sept. **1950.** 4 figs., 3 tables, graphs. Also: *New Zealand. Meteorological Service, Meteorological Office Note*, No. 34. **DWB**—Rainfall data from 46 stations in New Zealand are analyzed according to 3 criteria for drought: 1) absolute drought (15 consecutive days without .01″ on any day), 2) dry spell (15 consecutive days without .04″ or more rain any day) and 3) partial drought (29 consecutive days with mean rainfall .01″ per day). Partial droughts of long duration are more serious in respect to agriculture than absolute droughts since the latter are often broken by a light shower which does not appreciably alter the drought situation. Records vary in length from 29 to 83 years. Examples of serious droughts in history are cited and tabulated. *Subject Headings:* **1. Drought 2. New Zealand.**—*M.R.*

3.11–205 551.577.52:551.579

Rowe, P. B. and Hendrix, T. M., **Interception of rain and snow by second-growth ponderosa pine.** *American Geophysical Union, Transactions*, 32(6):903 908, Dec. **1951.** 3 figs., 2 tables, 6 refs. **MH-BH**—This paper reports the results of a six-year study to determine interception loss in a fully stocked 65- to 75-year-old second-growth ponderosa pine stand situated near Bass Lake, California. Interception loss was computed as the difference between measured precipitation and the sum of measured throughfall and stemflow. The average annual precipitation was 47 in., of which about 84 percent reached the forest floor as throughfall and four percent as stemflow. Twelve percent was interception loss. Throughfall, stemflow, and interception loss were directly related to storm size. Regression graphs and equations based upon this relation are given, which permit estimates of interception loss from storm precipitation. An average of four per cent more precipitation reached the forest floor during snow than during rainstorms. The interception process is illustrated by rate graphs showing when and how interception loss occurred during a typical storm. Interception loss consisted principally of the water retained by the vegetation during its initial wetting plus that lost by evaporation from the vegetation during storm intervals without precipitation. *Subject Headings:* **1. Forest influences 2. Soil moisture 3. Forest rainfall 4. Precipitation interception.**—*Authors' abstract.*

3.11–206 551.577.61:551.311:631.4

Bennett, Hugh Hammond; Bell, Forrest G. and Robinson, Bert D., **Raindrops and erosion.** *U. S. Dept. of Agriculture, Circular*, No. 895, Sept. **1951.** 23 p. 12 figs., bibliog. **DWB** Current knowledge of erosion is summed up. Investigations on the distribution and dynamics of falling raindrops undertaken by German and American scientists are reviewed. Changes in soil porosity under the impact of raindrops, the shielding effect of vegetation and erosion by running water are discussed. The program of the Soil Conservation Service is outlined. Graphs on dynamics of falling drops and two good photos of magnified splashing raindrops are presented. Other photos show examples of erosion and soil protection. *Subject Headings:* **1. Precipitation effects 2. Soil erosion 3. Soil conservation.**—*G.T.*

SNOW AND HAIL

(*See also items:* 3.11–4, 3.11–67, 3.11–180)

3.11–207 551.578.4:551.501(494)

*Davos, Switzerland. Eidgenössisches Institut für Schnee- und Lawinenforschung, **Schnee und Lawinen im Winter; Winterberichte.** No. 1/10, **1951.** [Snow and avalanches in winter. Winter report.] 84 p. photos, tables, graphs. On t-p.: **Schnee und Lawinen in den Wintern 1936/37 bis 1945/46.** [Snow and avalanches in the winters 1936/37 to 1945/46.] **DWB**—During the first ten years of the Snow and Avalanche Research Institute's work at the Weissfluhjoch in Switzerland, the methods of measurement and instrumental exposures were changed several times so that the data compiled herein are not completely homogeneous. In Pt. A (Meteorologie), by Th. Zingg, a brief description of temperature, cloud amount, wind direction and force, precipitation, snowfall, water content of snow, depth of snow, sunshine duration and radiation measurements and methods of observation is followed by the actual twice daily observations for each month from Sept. 1936 to July 1946. Pt. B (Die Schneedecke) by H. in der Gand, goes into great detail regarding the methods of measurement and snow cover conditions during each of the 10 winters. Complicated graphical presentation shows the snow cover profile for each day of each winter, and the character of the snow as determined from measurements, as well as wind, air temperature, radiation, and precipitation amounts, relative humidity, vapor pressure and hardness of snow crust. Other factors, such as formation, duration and disappearance of snow cover, frequency of snowfall, etc. are analyzed in detail. Pt. C by M. Scheld, covers the most important avalanches in the period, their characteristics, damage or loss of life, if any, and many photographs. *Subject Headings:* **1. Snow research stations 2. Observational data 3. Avalanches 4. Snow cover 5. Weissfluhjoch, Switzerland. I. Zingg, Theodor II. in der Gand, H. III. Scheld, M.**—*M.R.*

3.11–208 551.578.41:551.575.1:551.574.1(518)

Itō, Kyôji, **Phenomena of ice crystals in the air.** *Papers in Meteorology and Geophysics* 2(1):67–75, March **1951.** 5 figs., 7 tables. **DWB**—A study of ice crystals in the air in northern Manchuria revealed the following facts, viz.: ice crystals were formed usually in the atmosphere below an elevation of 400 m; on the average ice crystals were observed on 45.4 days in a winter at Hailar, between Nov. and March only. Data on the number of days with ice crystals in the air at Hailar for the period 1935–1943, data on monthly mean temperature, monthly mean maximum and mean minimum temperatures and absolute maximum and minimum temperatures during daylight, number of days with ice crystals and a map showing the distribution of number of days with ice crystals and mean winter air temperature in Manchuria are given. The relation of ice crystal formation to air temperature, vapor pressure, wind direction and velocity, and cloudiness is discussed. *Subject Headings:* **1. Ice fog 2. Ice crystal formation 3. Temperature data 4. Manchuria.**—*I.L.D.*

3.11–209 551.578.45(74)

Conover, John H.; Brooks, Charles F., and Howell, Wallace E., **The snowstorm of Feb. 21–23, 1950.** Blue Hill Meteorological Observatory, Contract Cwb-8135, Third Quarterly Progress Report, Aug. 25, **1951.** 18 p. graphs. Typewritten. **DWB**—A case history study of the distribution over New England of snow in the two snowstorms which affected the Boston area, and similar storms which gave only rainfall (June 7–9, 1947). The marked similarity in distribution of fall of snow in the two winter storms contrasts with the distribution of rain in summer storms. Seeding from upper level clouds (below freezing) is thought to be responsible for differences in summer patterns. Analysis of upper air soundings, surface fronts, air masses, development of systems, etc. has been made but the charts are not included herein. *Subject Headings:* **1. Snowstorms 2. New England. I. Blue Hill Meteorological Observatory II. Contract Cwb-8135.**—*M.R.*

3.11–210 551.578.46:551.586

†*Kosiba, Aleksander, **Czestosc szaty snieznej na Ziemiach Slaskich.** [Frequency of snow cover over the Silesian Territory.] *Wrocławskie Towarzystwo Naukowe, Prace, Ser. B.*, No. 21, **1949.** 92 p. 17 figs., 2 maps, 34 tables, 122 refs. **MH-BH, DLC**—A detailed technical

and statistical study of many aspects of snow cover in Silesia — one of the best works of this kind published. The general appearance, formation, thermal conductivity, radiation characteristics (solar radiation on surface and at different depths), outgoing radiation, thermal balance of ground and soil moisture under the snow cover; atmospheric turbidity and heat balance in lower levels above the snow cover; snow cover in relation to ecological, bioclimatic and transportation or communication conditions; hydrological factors (snow melt and runoff) and, lastly, the sources and nature of observational data used in this study are discussed. Detailed color charts, analytical and statistical diagrams and tables and an excellent bibliography are included. *Subject Headings:* **1. Snow cover 2. Snow characteristics 3. Silesia, Poland.**—*M.R.*

3.11–211 551.578.46:551.588.5:551.585.9:001

Tronov, M. V., **KHionosfera i snegovaia liniia.** [The "Chionosphere" and the snow line.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Izvestiia*, 82(5):472–486, Sept.–Oct. **1950.** 2 figs., table, 16 refs., 3 eqs. **DLC**—The chionosphere is defined as an atmospheric layer, which has an upper and lower boundary and within which the annual snowfall on any horizontal surface exceeds the annual melting and evaporation of snow. It is a layer of potential freezing capacity which becomes actual when the relief of the earth's surface penetrates into it. The article contains an analysis of the concept snow line, a discussion of the relationship between the freezing boundary and the lower and upper chionosphere and a discussion of climatic and orographic snow lines (snow line on icebergs, and the functional dependence of the height of the snow line upon climate and relief). *Subject Headings:* **1. Snow line 2. Chionosphere 3. Snow cover 4. Mountain meteorology 5. Definitions.**—*I.L.D.*

3.11–212 551.578.7:551.577.61:53

Decker, Wayne L., **Hail-damage frequency distributions for Iowa; and a method of evaluating the probability of a specified amount of hail damage.** *American Geophysical Union, Transactions*, 33(2):204–210, April **1952.** 3 figs., 4 tables, refs. **MH-BH**—On the basis of the dollar hail damage data collected by the Iowa State Department of Agriculture, a method is derived for defining the frequency distribution of hail damage to agricultural crops. These frequency distributions are used to evaluate the nature of the hail damage in various geographical areas and for estimating the probability of specified amount of hail damage. *Subject Headings:* **1. Hail damage 2. Hail damage probability 3. Hail frequency 4. Iowa.**—*From author's abstract.*

3.11–213 551.578.7

Roth, Richard J., **Hailstones and hailstorms.** *Weatherwise*, 5(3):51 54, June **1952.** 4 figs. **MH-BH**—A nontechnical article discussing the structure of hailstones, various theories accounting for their formation, geographical distribution of hailstorms in the United States and method of hail prevention. Maps showing average number of days with hail (1899 1938) in the U. S. and distribution of hail insurance rates for grains in 1950 in the U. S. are shown. *Subject Headings:* **1. Hail structure 2. Hail formation 3. Hail damage 4. United States.**—*I.L.D.*

HYDROMETEOROLOGY

(*See also items:* 3.11–15, 3.11–205)

3.11–214 551.579

Coutagne, Aimé, **Météorologie et hydrologie; étude générale des variations de débit en fonction des facteurs qui les conditionnent. Quatrième partie.** [Meteorology and hydrology; a general study of runoff variations as a function of the factors which cause them. Pt. 4.] *La Houille Blanche*, Grenoble, No. 1, Jan.–Feb. **1950.** 17 p. 14 figs., 4 tables, ref., eqs. Abstracted from reprint. **DLC**—Author emphasizes effect of temperature in hydrology. The thermofluvial cycle in glacial basins is analyzed, and the runoff is shown to be a simple linear function of temperature, especially in summer, over periods of a few successive days. Full insolation increases the runoff over that appropriate to the temperature. Effect of

precipitation is complex—rain alone increases runoff but is associated with cool, cloudy weather; the combined effect is to minimize fluctuations. Finally, ablation from snow is discussed. *Subject Headings:* **1. Hydrology 2. Runoff 3. Ablation.**—*C.E.P.B.*

3.11–215 551.579

Edson, Charles Grant, **Parameters for relating unit hydrographs to watershed characteristics.** *American Geophysical Union, Transactions*, 32(4):591–596, August **1951.** 2 figs., 2 tables, ref., 19 eqs. **DWB**—The parameters developed for correlating watershed characteristics to the unit hydrograph are expressed by the following equation $Q = BT^x e^{-yT}$; Q is discharge in cubic ft/sec corresponding to T time in days reckoned from the beginning of runoff; B, x and y are constant for particular unit hydrograph. A method for converting Qm (quantity of maximum discharge) and Tm (time of maximum discharge) to values of x and y is presented. *Subject Headings:* **1. Runoff 2. Hydrographs 3. Watersheds.**—*I.L.D.*

3.11–216 551.579

*§Flach, Emil, **Besonderheiten im hydrometeorologischen Charakter des mitteldeutschen Hoch- und Spätwinter. Der Dauerregen vom 8. Februar 1946 in Mitteldeutschland und seine meteorologischen Ursachen.** [Hydrometeorological characteristics of the central German midsummer and late winter.] *Germany. Deutsche Demokratische Republik. Meteorologischer Dienst, Abhandlungen*, No. 5, **1951.** 56 p. 39 figs., 26 refs. Price: 11,75 DM. **DWB**—A detailed investigation of the hydrometeorological characteristics of a number of annual curves of rainfall manifested in the highlands of the mountains in central Germany and the surrounding plains with special reference to flood conditions during midsummer and late winter. The annual course of runoff and precipitation in central Germany, the regime of rainfall amount and frequency, and rainfall and frequency from Jan. to March, their characteristics and causes in Northern Germany and their importance for glazed conditions and their relationship to river flow are discussed. The increased Feb. precipitation during the period 1920–1940 which is associated with intensified oceanity is investigated. The course of winter temperature for the same months is analyzed and correlated with the precipitation regime. A synoptic analysis of individual weather conditions in 1946, and of the water regime of the Wipper, Zorge and Thyra Rivers is presented. The possibility of forecasting winter rain and flood phenomena is discussed. The article contains extensive statistical data, synoptic charts and graphs. *Subject Headings:* **1. Hydrometeorology 2. Precipitation regime 3. Runoff 4. Central Germany.**—*I.L.D.*

3.11–217 551.579.2:551.577.2:551.577.51(467)

Jansá Guardiola, José María, **Hidrología superficial de la isla de Mallorca.** [Surface hydrology of the island of Majorca.] *Revista de Geofísica*, Madrid, 10(38):98–117, April/June **1951.** diagrs., tables, charts, refs. **DWB**—In addition to description of physiography of the island as a whole and the various basins separately, the rainfall regime on the island is described and annual isohyets shown for each 100 mm interval from 200–1300 mm. The relation of rainfall to orography is shown in profile on another graph, and the area, total and mean precipitation for each of 12 areas or river basins for Feb., May, Aug. and Nov. and for the year shown in tables and graphs; based on data from 56 stations in Majorca. *Subject Headings:* **1. Precipitation variations 2. Runoff 3. Orographic influences 4. Majorca, Balearic Islands.**—*M.R.*

3.11–218 551.579.1:628.1(72)

Wagner, Helmuth O., **Der Wasserhaushalt des Hochtales von Mexiko.** [The water economy of the high level valley of Mexico.] *Erdkunde*, 6(2–3):162–168, June **1952.** 3 figs., 11 refs. **DLC** The existing water shortage during the dry season in Mexico City is attributed, not to a change of climate, but to the pressure of population and the resulting disturbance of the balance of nature, deforestation and exhaustion of underground supplies. The last has caused soil shrinkage and broken drainage and water supply pipes. Conservation of winter rains by afforestation is proposed. *Subject Headings:* **1. Water conservation 2. Mexico.**—*C.E.P.B.*

3.11–219 551.579.2

Popov, E. G., **O postanovke eksperimental'nykh issledovaniĭ na stokovykh stantsiiakh.** [On the organization of experimental investigations at river stations.] *Meteorologiia i Gidrologiia*, No. 4:18–23, Dec. **1950.** table. **DLC**—Some basic rules and considerations on the manner of organizing experimental investigations of spring runoff. Such investigations of hydrologic processes must be organized in a manner which will make it possible to trace their interrelation in the general process of spring runoff formation in order to establish all basic characteristics of the process indispensable for future forecasts. Seven specific problems are tabulated along with the aim of research and methods of observation in each field. These problems are: 1) accurate estimate of water content of snow cover of a basin, 2) evaporation from the surface, 3) snow melt, 4) snow surveys in a basin, 5) infiltration of melt water in ground, 6) retention and release of retained water in a basin and 7) channel and current problems. *Subject Headings:* **1. Hydrometeorological research 2. Snow surveys 3. Runoff.**—*A.M.P., M.R.*

3.11–220 551.579.4(784)

§Nelson, Elmer R., **Red River of the North basin flood, April–June 1950.** *Monthly Weather Review*, 79(9):169–178, Sept. **1951.** 16 figs., 2 tables, 5 refs. **DWB**—A case history including a description of climatological and topographical factors and meteorological conditions. Several synoptic charts, a hydrographic chart and charts showing depth of snow, precipitation and temperature values, hydrographs and tables showing water level readings. A comparison with previous floods in the area is made. Crests were highest in past 100 years. *Subject Headings:* **1. Floods 2. Red River of the North, United States 3. North Dakota.**—*G.T.*

3.11–221 551.579.2

Gurevich, M. I., **O zavisimosti intensivnosti snegotaianiia ot temperatury vozdukha.** [The dependence of the rapidity of snow melt on air temperature.] *Meteorologiia i Gidrologiia*, No. 3:44–48, Nov. **1950.** fig., 2 refs., 6 eqs. **DLC**—The author develops an empirical relationship between rate of snow melt and the sum of positive hourly temperatures for forest and field. For snow melt in the forests the equation is $J = 0.0023\ \theta^2 - 0.115$, where J is rate of snow melt in mm/24 hr and θ = mean of sum of daily positive hourly temperatures in degrees/24 hr. *Subject Headings:* **1. Snow melt 2. Temperature effects.**—*I.L.D.*

3.11–222 551.579.4:551.509.3:519.24

Benham, A. D. (*New Zealand Min. of Works*), **The estimation of extreme discharges by statistical methods.** *New Zealand Institution of Engineers, Wellington, Proceedings*, v. 50:119–187, **1950.** 24 figs., 13 tables. **DWB**—The paper presents what are considered to be the most practical of statistical methods, namely, those of Foster and Gumbel; it also gives a logical method for estimating flood discharges from rainfall records when runoff records do not exist. Quantitative examples are worked out for each method, and the results of the analysis of the records of 16 gaging stations, some of them extending over 40 years, are given in graphical and tabular form. The paper concludes with a brief discussion on the results obtained and some references to the applicability of statistical methods to estimates of stream flow. *Subject Headings:* **1. Statistical forecasting 2. Floods 3. River discharges. I. New Zealand. Soil Conservation and Rivers Control Council, Wellington.**—*Partly from author's abstract.*

3.11–223 551.579.4:543.3(775)

Bryson, R. A. and Suomi, V. E. (*Univ. of Wisc.*), **Midsummer renewal of oxygen within the hypolimnion.** *Journal of Marine Research*, 10(3):263–269, Dec. 31, **1951.** 6 figs., 2 refs. **DWB**—A very rainy period in the summer of 1950 was followed by unusually high values of dissolved oxygen at several levels within the hypolimnion of Lake Mendota (Wisconsin). It is postulated that the oxygen was introduced into the hypolimnion by density currents of cold, silt laden, well oxygenated runoff water. *Subject Headings:* **1. Oxygenated water 2. Runoff 3. Wisconsin.**—*I.L.D.*

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATOLOGY

(*See also item:* 3.11–43)

3.11–224 551.58(02)

Nekrasov, Petr Il'ich, **Klimaticheskiĭ ocherk zemnogo shara.** [Climatic sketch of the earth.] Moscow, Gosizdat., **1950.** 115 p. 38 figs. **DLC**—A small handbook on the climate of the globe designed for use in high schools. Book is divided into 7 chapters on: general information on the earth's rotation, shifting seasons, concepts of climate and weather formation processes, distribution of air temperature, pressure, wind currents, precipitation and cloudiness; climatic belts of the globe and climatic zones of U.S.S.R. with a description of their homoclimes; estimation of conditions and phenomena affecting climate and its changes in present and in geologic time; discovery of Arctic regions and conquest of the poles. Many graphs, figures and photographs illustrate the text. *Subject Headings:* **1. Climatology 2. Climate of the world 3. Handbooks.**—*A.M.P.*

3.11–225 551.581(213)

Fletcher, Robert D., **Modern trends in the tropical meteorology of the Americas.** *Academia Colombiana de Ciencias Exactas, Físicas y Naturales, Bogota, Revista,* 7(28):552–556, May **1950.** diagrs. **DLC**—A general discussion of advances in knowledge of tropical meteorology during the Second World War, and a more detailed discussion of (a) the *climate* of the tropics with particular reference to the area around Panama and Central America and (b) the meteorology or *unusual weather* occurring in the tropics, comparing conditions in the Panama region with those in India. The general circulation, trade wind and intertropical convergence zones, cloud and hurricane systems are discussed and illustrated schematically. *Subject Headings:* **1. Tropical meteorology 2. Tropical climates 3. Panama 4. Central America.** *M.R.*

3.11–226 551.582:629.13:37(02)(497)

Germany. Reichsluftfahrtministerium, **Luftgeographische Beschreibung wichtiger Flugstrecken des Ost- und Süd Balkans.** [Aerial geographic descriptions of important air routes of the east and south Balkans.] [**1943?**] unpaged. maps. Reprint of sections 1, 7 and 5 of v. 1–2 of its **Luftgeographische Beschreibungen der Balkanländer.** [Aerial geographic descriptions of Baltic countries.] **DWB**—Detailed instructions for flying in the most dangerous flying region of Europe. Due to the irregular direction of mountain ranges the local climate is very variable. Severe gustiness, sudden thunderstorms, unexpected downdrafts and icing are often experienced. The most dangerous place and the peculiarities of weather during 12 different weather situations are described for each of 17 flying routes. Bad weather routes are given on detailed flying charts for each sector. *Subject Headings:* **1. Aeronautical climatology 2. Training manuals 3. Balkans.**—*A.A.*

3.11–227 551.582:551.585:3(54,548.7)

*Krebs, Norbert, **Das Klima.** [Climate.] (In his: **Vorderindien und Ceylon.** [India and Ceylon.] Stuttgart, Union Druckerei, **1939.** p. 24–35. figs., 5 maps, 2 tables, 40 refs.) **DLC** In this chapter there is a vivid description of the climate of India with its three seasons controlled by summer and winter monsoons and its effect on human life and on vegetation. The area is divided into 7 climatic zones including Ceylon. Seasonal precipitation and temperature variation curves for various places in India and precipitation and evaporation charts for the entire territory (excluding Ceylon) are presented. Mean values of temperature, humidity, rainfall, cloudiness and wind velocity are tabulated for 38 stations. *Subject Headings:* **1. Climate of India 2. Monsoon climates 3. Climatic zones 4. India 5. Ceylon.**—*G.T.*

3.11–228 551.582.1(54)

Butt, M. T. (*Geogr. Dept. Panjab Univ.*), **Climate of the Pak Punjab.** *Pakistan Geographical Review,* Lahore, 5(1):52–58, **1950.** **DLC**—A brief review of general climate, soil and agricultural conditions in the Punjab area of Pakistan. The summers are extremely hot and

not as moist as other monsoon areas. The winters are cold and dry with occasional frost and cold NW winds. Cyclonic rains in winter are as valuable for crops as the monsoon rains since evaporation is lower in the winter than in the monsoon season. The area would be a desert if it were not for the constant supply of irrigation water from melting snow in the high mountains. Floods increase soil fertility and low rainfall prevents leaching of soil. *Subject Headings:* **1. Climate of Pakistan 2. Punjab, Pakistan.**—*M.R.*

3.11–229 551.582.1(771)

*Hutter, Harry K., **Eighty years of weather and climate at Toledo, Ohio.** *Ohio Journal of Science*, 52(2):62–75, March **1952.** 7 figs., 4 tables, 4 refs. Abstracted from reprint. **DWB**—A nicely presented study of climatic conditions in Toledo. Means, extremes, year to year variation from normal of temperature and precipitation during each of the 80 years (1871–1950) are presented graphically and discussed. Sky cover, storms, humidity, fog, heating degree days, glaze, winds, thunderstorms, snowfall and heavy rains are also discussed. Relationship between temperature and precipitation, trends, variability, etc. also discussed critically. *Subject Headings:* **1. Climatic data 2. Climate of Toledo, Ohio 3. Toledo, Ohio.**—*M.R.*

CLIMATIC CHANGES

3.11–230 551.583.13:525.3

Nicolini, Tito, **Indizi di correspondenze tra fenomeni geofisici e moto polare.** [Indexes of correlations between geophysical phenomena and movements of the pole.] *Naples. Osservatorio Astronomico di Capodimonte, Contributi Geofisici, Ser. 2*, No. 10. Rome, Accademia Nazionale del Lincei, **1950.** [18] p. graphs, tables. **MH-BH**—An attempt is made to show relations between earthquakes, volcanic eruptions, weather (temperature and pressure), the level of Lake Victoria, temperature of Mississippi River water at New Orleans, variations in earth's magnetic field, etc. with Chandler's cycle (about 14 months) in the rotation of the terrestrial axis around the pole. The usual long-period records are analyzed (New Haven, Washington, D. C., Bombay, Madras, etc.) and comparisons made with WOLF numbers. *Subject Headings:* **1. Climatic variations 2. Polar orbit 3. Geophysical phenomena.**—*M.R.*

3.11–231 551.583.14:551.311.12

Morawetz, Sieghard, **Klimabeziehungen des Gletscherverhaltens in den Ostalpen.** [Climatic relations of the glacier retreat in the east Alps.] *Zeitschrift für Gletscherkunde und Glazialgeologie*, 2(1):100–105, **1952.** 2 tables, 9 refs. **DLC**—Since 1920 east Alpine glaciers have decreased rapidly in area and volume. On Sonnblick this was associated with increased summer temperature, increased sunshine duration in summer and greatly decreased precipitation both in summer and year as a whole. As a climatic indicator he adopts summer precipitation/(10+5×departure of summer temperature from normal); this has halved since 1915. *Subject Headings:* **1. Climatic trends 2. Glaciers 3. Austrian Alps.**—*C.E.P.B.*

3.11–232 551.583.2(44)(09)

Mellot, A., **Contribution à l'étude de la climatologie de la France, au cours des siècles passés.** [Contribution to the study of the climate of France in past centuries.] *La Météorologie*, 4th Ser., No. 24:271–273, Oct./Dec. **1951.** **MH-BH**—Notes on severe winters, hailstorms, famines and floods, between 1647 and 1665, 1692 and 1729, and 1804 and 1831 in France, with actual quotations from manuscripts of the period. *Subject Headings:* **1. Climate of France 2. Severe winters 3. Chronology 4. France.**—*M.R.*

3.11–233 551.583.24(492)

Koch, L., **Was het klimaat in het begin van de zeventiende eeuw zachter dan nu?** [Was the climate of the beginning of the seventeenth century milder than now?] *Hemel en Dampkring*, 50(5):83–84, **1952.** **MH-BH**—The author cites some historical data from the writings of PETRUS HONDIUS in 1621 on the cultivation of wine grapes, apricots, figs and other warm climate plants in Holland during the 17th century. The author concludes that from the successful cultivation of these plants the summers must have been warmer in the 17th century. *Subject Headings:* **1. Climatic changes 2. Historical climates 3. Netherlands. I. Hondius, Petrus.**—*I.L.D.*

MICROCLIMATOLOGY

(*See also items:* 3.11–36, 3.11–37, 3.11–51, 3.11–145, 3.11–169, 3.11–274)

3.11–234 551.584:551.586:63(794)

*Brooks, F. A. (*Davis, Calif.*), **Thermal interpretation of spot climate operation; syllabus for Agricultural Engineering 106, University of California at Davis. 1950.** 134 p. tables, graphs, diagrs., bibliog. Mimeographed. **MH-BH**—A most thorough and original treatment of the entire field of micrometeorology as applied to agricultural activities, based on the physical processes resulting from radiation variations, heat and vapor transfer. The emphasis is on frost protection, irrigation, sun drying, effect of wind breaks, evapotranspiration and other engineering aspects rather than the statistical aspects which have been represented by studies on the relation of climate or weather on crop yields. The various sections, original charts, tables, illustrations, etc. cannot even be enumerated, but such special studies of dispersion of spores, and smog, hail and thunderstorm distribution, fire hazard due to desiccation, shields to conserve sunshine, radiation and moisture losses from vegetation, frost protection by heaters of various types, by smoke and wind machines, local climates, annual cycles of various elements, etc. based on data obtained mostly in California during the last 20 years, are presented in this preliminary edition. *Subject Headings:* **1. Micrometeorology 2. Agricultural meteorology 3. California. I. California. University at Davis.**—*M.R.*

3.11–235 551.584.4:631:551.588.6:551.509.6(94)

Loewe, Fritz, **Some microclimatic considerations of agricultural interest.** *Australian Institute of Agricultural Science, Journal*, 17(1):2–6, March 1951. tables. **DLC**—A general discussion, supported by representative tabular data, of the several aspects of microclimate as affecting crops. Variations in radiation on different exposures or inclinations at various latitudes south of the equator and various seasons, variations in heat loss and gain on the ground with different soils or covers, temperature gradient in crops in comparison with the free air, and effects of vegetation on humidity, on wind velocity, etc. are treated. Finally, methods of modifying the microclimate such as shelter belts, increasing water surfaces, artificial rainfall, heating and sprinkling orchards or using wind machines to prevent frost damage are mentioned. *Subject Headings:* **1. Microclimatology 2. Climatic control 3. Agronomy 4. Agriculture 5. Australia.**—*M.R.*

3.11–236 551.584.4:551.586:633.71

†Trappenberg, R., **Untersuchungen über die mikroklimatischen Wirkungen künstlicher Beregnung im Tabakbestand.** [Investigations on the microclimatic effect of artificial watering in a tobacco stand.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, B*, 4(1):65–84, **1952.** 9 figs., 46 refs. German, English and French summaries p. 65–66. **DWB**—Frequent observations with thermoelectric psychrometers were made in 3 tobacco patches in July and Aug. 1951, two (shaded and unshaded) with sprinklers and one control, at heights from ground to over 1 m. The results, using different amounts of water, are shown in a series of isoline diagrams. Sprinkling and shading were effective in increasing humidity, especially long and gentle (2 mm/hr) in a summer morning, equivalent to a gentle rain, which gives a favorable soil and microclimate through the day. Results are compared with natural rain. *Subject Headings:* **1. Micrometeorology 2. Irrigation.**—*C.E.P.B.*

3.11–237 551.584.6:577.4

Funk, E. M. and Forward, James, **Effect of humidity and turning of eggs before incubation on hatching results.** *Missouri. Agricultural Experiment Station, Bulletin*, No. 554, May **1951.** 24 p. tables, graphs.—The effect of atmospheric temperature and humidity upon the hatching of chicken eggs is investigated by holding eggs prior to incubation at temperatures of 55°F with relative humidities of 80–88%, 62–67%, and 42–50% and at 70°F with 80–90%, 55–65% and 35–45% humidities. At 55°F high holding humidity increases slightly the percentage of hatch of all eggs and increases somewhat more the percentage hatch. At 70°F high humidity brought about a greater increase in percentage of hatch of all eggs. *Subject Headings:* **1. Microclimatology 2. Poultry husbandry.**—*I.L.D.*

3.11–238 551.584.6:551.586:612

Grunow, Johannes, (*Dachau*), **Ideales Bettklima.** [Ideal bed climate.] *Umschau*, Frankfurt a.M., 50(24):748, Dec. **1950.** 2 figs., 1 ref. **DLC**—This work is a continuation of that done by H. Landsberg. It is pointed out that maximum temperature in a bed, while used, is around 30°C; less if the bed was initially cold. The decrease in temperature by the end of the night is put at 5–12.5°. Three-part mattresses are indicated as admitting a lowering of temperature of 12–13°C in the kidney region, while the temperature remains virtually unchanged on other parts of the body. A blanket of 6 mm thickness, made of special cotton and used on top of the mattress, is recommended and claimed to maintain equal distribution of temperature. Heat distribution with and without the blanket is shown on two schematic drawings. *Subject Headings:* **1. Bed climates 2. Physiological climatology. I. Landsberg, Helmut E.**—*G.T.*

CLIMATIC CLASSIFICATION

(*See also items:* 3.11–149, 3.11–174, 3.11–211, 3.11–227)

3.11–239 551.585:551.589.1

Aujeszky, László, **Kisérlet az éghajlat fogalmának pontosabb meghatározására.** [An attempt at a more complete formulation of the concept of climate.] *Időjárás*, 54(5/6):140–145, May/June, **1950.** English summary, p. 191. Jordan, Károly, **Megjegyzés az éghajlat fogalmának meghatározásához.** [Notes on a more complete definition of climate.] *Időjárás*, 54(7/8):197–198, July/Aug. **1950.** 2 refs., equation. **MH-BH**—Basic ideas on the notion of weather, climate and climatic indexes are developed in general terms and the concept of "climate" determined as ". . . the sum of all weather possibilities of a certain place, including data on the probability of each synoptic element" are presented in Aujeszky's article. In reference to L. Aujeszky's article, Jordan explains a statistical method of determining means and standard deviations and quotes the Laplace formula for calculating the probability of deviations. *Subject Headings:* **1. Climatic classifications 2. Definitions 3. Synoptic climatology. I. Jordan, Károly.**—*G.T.*

3.11–240 551.585:551.515

Dammann, Walter, **Grundlagen für eine Klimaeinteilung der Nordhalbkugel nach dem Witterungsverlauf.** [Bases for a climatic classification of the Northern Hemisphere according to the course of weather.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 35:284–293, **1952.** 12 figs., 5 refs. **MH-BH**—Daily weather changes are given insufficient weight in climatic classifications. Examples given of Batavia, Potsdam, Goa, Barnaul, Antofagasta. In this preliminary paper author advocates frequency distribution of pressure as a basis. He uses N. Hemisphere maps of frequencies of depressions and anticyclones as an example. This shows that an idealized distribution of climatic types over an "ideal" continent and ocean is not practicable. *Subject Headings:* **1. Climatic classifications 2. Atmospheric disturbances 3. Northern Hemisphere.**—*C.E.P.B.*

3.11–241 551.585(469)

Morais, J. Custodio de, **Divisão climatica de Portugal.** [Climatic regions of Portugal.] Coimbra, Tipografia da Atlântida, **1950.** 27 p. 4 figs., tables, 4 refs. English summary p. 27. **DWB**—The climate of Portugal is classified by means of the potential evapotranspiration method of Thornthwaite. The annual means of potential evapotranspiration for Montalegre, Moncorvo Coimbra and Campo Major, and maps of the distributions of potential evapotranspiration and of the various climatic regions are given. The author concludes that the method of Thornthwaite is best suited to classify the climate of Portugal. *Subject Headings:* **1. Climatic regions 2. Thornthwaite's classification 3. Evapotranspiration 4. Portugal.**—*I.L.D.*

3.11–242 551.585.53:631:061.3

Meigs, Peveril (*U. S. Army, OQMG. Wash., D. C.*), **Progress of Arid Zone Research Program.** *International Geographical Union Newsletter*, 11(2):16–17, Aug. **1951. DWB**—Report on conference in Paris Nov. 20–23, 1950 when the UNESCO Interim Arid Zone Re-

search Council outlined its program for 1951 and 1952. During 1951 a survey of literature on climatology, hydrology and other fields particularly applicable to arid zone water supply problems was planned for 8 large arid divisions of the world. Dr. Meigs was assigned the task of preparing homoclimatic maps of the arid regions. In 1952 the emphasis will be on arid zone plant ecology. *Subject Headings:* **1. Arid zone research 2. Water supply 3. Plant ecology 4. UNESCO International Arid Zone Committee.**—*M.R.*

3.11–243 551.585.53:06

Thornton, H. G. and Goldstein, S., **Arid zone research.** *Nature*, London, 170(4321):300–302, Aug. 23, **1952. DWB**—Thornton describes activities of the Advisory Committee on Arid Zone Research set up by UNESCO. Goldstein gives account of symposium in Israel May 7–14, 1952. *Subject Heading:* **1. Arid zone research.**—*C.E.P.B.*

BIOCLIMATOLOGY

(*See also items:* 3.11–162, 3.11–210, 3.11–234, 3.11–236, 3.11–238, 3.11–271)

3.11–244 551.586:612(02)

Bradtke, Franz and Liese, Walther, **Hilfsbuch für raum- und aussenklimatische Messungen für hygienische, gesundheitstechnische Zwecke.** [Manual for measuring indoor and outdoor climates for the use of hygienic, and industrial medical purposes.] 2nd rev. ed. Berlin, Springer Verlag, **1952.** 108 p. 37 figs. **DLC**—This concise and useful manual covers the following topics: the physical and physiological principles of the thermal balance of human beings; the regulation of body temperature and the maintenance of thermal balance in the presence of variable air movement, dry and humid air and radiations; climatic adaptation and comfort measurements; methods for measuring (1) dry and wet bulb and radiation temperature, (2) absolute and relative humidity; (3) air movement, (4) resultant temperature, equivalent temperature and radiation temperature. The application of these measurement techniques to indoor and outdoor conditions is discussed and the standards of temperature, humidity and air movement suitable for various types of indoor climate, including private dwellings, public rooms, hospitals, etc. are presented with particular reference to Germany. A supplement giving a method for determining the CO_2 content of the atmosphere and a psychometric table giving the vapor pressure of radiated air and meteorological data for the cities, and tables giving limiting temperature and relative humidity for various industrial establishments are included. *Subject Headings:* **1. Human climatology 2. Medical meteorology 3. Meteorology 4. Handbooks 5. Germany.**—*I.L.D.*

3.11–245 551.586:612:551.501.6(71)

Currie, B. W., **Sensations isopleths on a wind-temperature diagram for winter weather on the Canadian prairies.** *American Meteorological Society, Bulletin*, 32(10):371–374, Dec. **1951.** 2 figs., 3 refs. **MH-BH**—Sensation records of weather kept by 35 moderately active individuals during two successive winters were used to construct sensation isopleths on a wind temperature diagram. A high consistency of responses was obtained for a given range of temperature and wind conditions. A comparison of the sensation isopleths with wind chill isopleths calculated by the formula of Siple shows that the sensation isopleths are not lines of constant wind chill. The sensations are very sensitive to wind speeds greater than 20 mi/hr instead of being less sensitive as are the wind chill isopleths. A critical comment on the physical and physiological difficulties of subjective evaluation of thermal stress by Court and Sissenwine is appended. *Subject Headings:* **1. Sensation isopleths 2. Wind chill 3. Temperature effects 4. Canadian Prairies.**—*I.L.D.*

3.11–246 551.586:612:551.577.32(94)

Gentilli, J. (*Univ. West Australia*), **Climatic discomfort in W. A.** *Western Australia. University. Geographical Laboratory, Research Report* No. 24, April **1951.** 18 p. graphs, diagr., tables, refs. **DWB**—In order to establish a rational and scientific basis for the climatic discomfort allowances provided to workers in Western Australia by the State Arbitration

Court, the climate of Western Australia is subdivided into climatic zones characterized by different mean annual effective temperatures, and the comfort of each zone is assessed in terms of comfort levels for sedentary workers established by YAGLOU and in terms of comfort required by different kinds of physical activity. The author suggests that the "annual number of day-degrees above 69°F (effective temperature) be taken as the criterion for climatic discomfort arising from heat, and that heat discomfort zones be determined for every 600 annual day-degrees above 69°F (E.T.)." The zones of climatic discomfort for Western Australia are shown on a map. Also the history of climatic discomfort allowances in Australia is reviewed. *Subject Headings:* **1. Climatic discomfort 2. Climate of Western Australia 3. Annual temperature variations 4. Comfort zones 5. Australia.**—*I.L.D.*

3.11–247 551.586:612

Lauscher, Friedrich (*Vienna*), **Die bioklimatischen Bedingungen für Winterarbeit im Freien.** [Bioclimatic conditions for outdoor work in winter.] *Wetter und Leben*, Vienna, 3(11/12):264–265, Dec. 1951. **MH-BH** The author establishes a scale of weather conditions, in terms of rainfall, wind velocity, air temperature and soil conditions which either permit freely, hinder slightly, hinder considerably, or render impossible, physical work in the outdoors during the winter in Austria. *Subject Headings:* **1. Climatic comfort classifications 2. Human ecology 3. Austria.**—*I.L.D.*

3.11–248 551.586:612(54)

Mookerjee, G. C. and Murgai, M. P., **A preliminary report on the determination of comfort zone of Indian subjects during north Indian summer.** *Journal of Scientific and Industrial Research*, India, 11(1):14–15, Jan., 1952. 5 refs. **DLC**—History of medical meteorology and of comfort indexes briefly reviewed; complications in establishing "comfort" criteria are stressed. The nearest approach to measurement of comfort is the "operative temperature" scale [$T_0 = 0.48$ mean radiant temperature $+ .19\sqrt{v} \cdot T_a - (\sqrt{v} - 2.76)t_a$] of GAGGE (1941), but it is unsuitable for clothed people. Corrected Effective Temperature (C.E.T.) of VERNON and WARNER was tested for conditions of north India by obtaining 600 observations and an opinion survey of subjective comfort. A 5-point scale is devised therefrom and tentative C.E.T. limits assigned to each (<69°, 69–76°, 77–80°, 81–83° and >83°) for (1) cool, (2) comfortable and pleasant, (3) comfortable, (4) hot and uncomfortable and (5) extremely hot. Above 86–87° C.E.T. intolerably hot. C.E.T. takes into account dry and wet bulb temperatures, wind velocity and radiation from surroundings. *Subject Headings:* **1. Comfort indexes 2. Physiological climatology 3. North India.**—*M.R.*

3.11–249 551.586:612:551.594.1

Reiter, Reinhold, **Luftelektrische Elemente und biologische Reaktionen an Tagen mit kosmischen Störungen.** [Atmospheric electricity and biologic reactions on days with cosmic disturbances.] *Wetter und Leben*, Vienna, 3(11/12):248–251, Dec. 1951. 2 figs., 3 refs. **MH-BH**—The author plotted curves of hourly sequence of chromospheric disturbances in Hα days with magnetic disturbances and days with sudden appearance of sunspots parallel with curves of simultaneous measurements of skin resistance on patients and on normal individuals, with curves of weather complaints of patients with brain injuries, with curves of limb sensations in amputees and with curves of traffic accidents in Munich. He believes to have established a definite positive relationship between atmospheric electricity and the various biological phenomena, but these positive correlations are occasionally masked by other correlations which are ultimately of astrophysical origin. *Subject Headings:* **1. Bioclimatology 2. Atmospheric electricity 3. Magnetic disturbances 4. Sunspots 5. Austria.**—*I.L.D.*

3.11–250 551.586:615.8

Caroli, Günther and Pichotka, Josef, **Beeinflussung der normalen Blutgerinnungszeit durch das Wetter.** [Influence of the weather on the normal time of coagulation of the blood.] *Naturwissenschaften*, 39(9):193–195, May 1, 1952. 3 figs., 3 tables, 6 refs. **DWB**—Observations of time of coagulation of blood of dogs showed variations up to +40 and −30% of the mean value. Positive departures were associated with turbulent processes in the atmosphere and with northern air masses; negative departures were associated with upsliding, especially

from the south, and southern air masses. No relation was found with geomagnetic disturbances. *Subject Headings:* **1. Medical meteorology 2. Coagulation of blood.**—*C.E.P.B.*

3.11–251 551.586:615.8

*Poncelet, Lucien (*Chief of Climatology, Uccle, Belgium*), **Aperçu sur le climat du littoral belge.** [Survey of the climate of the Belgian coast.] *Belgium. Institut Royal Météorologique, Miscellanées*, Fasc. 43, **1951.** 23 p. tables, graphs, refs. **MH-BH**—A brief survey of the average conditions, the variability, frequency, typical sequences, etc. of the weather and climate along the seacoast of Belgium with a view to determining its salubrious effects (curative, sedative or stimulating) in comparison with other resort areas of Europe. The only long period record for temperature is that at Ostend (1903–30), for precipitation there are 3 additional records for 1901–1930, for wind only. Ostend airport (1930–39). These data are compared graphically with those from Uccle and isothermal charts show mean temperature and diurnal variation. Tables show comparison with other parts of Europe and the effects of increase in insolation, humidity, frequency of sea breezes and purity of air, etc. are discussed. Frequency and variability in air mass type, duration of periods of good or bad, hot or cold weather, and in sea temperature and sea-air temperature are also discussed and illustrated. *Subject Headings:* **1. Climatology 2. Climatotherapy 3. Marine climates 4. Seaside resorts 5. Belgium.**—*M.R.*

3.11–252 551.586:612.79:551.521.1

Heer, Raymond R., Jr., **The absorption of human skin between 430 and 1,010 mμ for black-body radiation at various color temperatures.** *Science*, Wash., D. C., 115(2975):15–18, Jan. 4, **1952.** fig., 2 tables, 3 refs. **DLC**—A comparison of the maximum expected absorption of tanned and untanned skin of whites and negroes between 430 and 1010 mμ for 2000° to 25,000°K. Average absorption values were calculated from average reflectance curves measured with a G-E recording spectrophotometer. The procedure for calculating the amount of radiation absorbed from a radiator at a given color temperature is outlined. Data on ratio of expected absorption of average tanned and untanned white and negro skin for various color temperatures and on expected relative absorption for average tanned and untanned white and negro skin are given. Tanned negro skin on the average absorbs 24% more than the tanned white skin and tanned skin absorbs more than untanned skin in both races, but more in the white than in the negro race. *Subject Headings:* **1. Skin radiation absorption 2. Color temperatures 3. Radiation effects.**—*I.L.D.*

3.11–253 551.586:616

Fladung, Horst Josef, **Plötzlicher Herztod und Wetter.** [Sudden heart failure and weather.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, 4(1):85–96, **1952.** 2 figs., 5 tables, 17 refs. German, English and French summaries p. 85–86. **DWB**—From 100 cases of heart failure in Frankfurt a.M. it was found that frequency increased with disturbed weather, unstable ascending motion and fronts. *Subject Headings:* **1. Medical meteorology 2. Heart diseases.**—*C.E.P.B.*

3.11–254 551.586:63(6)

Grinsted, W. A. (*Met. Dept., Nairobi*), **Climatology in relation to land use.** (In: **African Regional Scientific Conference, Johannesburg, Oct. 17–28, 1949.** 2:45–46, **1950.** In English. French summary p. 45.) **DWB**—The author stresses the insufficiency of monthly and annual mean temperatures for agrometeorological studies and stresses the importance of degree hours within favorable temperature ranges for crops. An instance is cited in which a change in the mean temperature of 2°F may make a difference of 45 percent in effective degree hours. The author mentions research for the purpose of estimating the daily receipt of solar radiation from observations in a thermometer screen. *Subject Headings:* **1. Agricultural climatology 2. Land utilization 3. Radiation effects 4. Africa.**—*I.L.D.*

3.11–255 551.586:631:551.577.2

Skerman, P. J., **The utilization of low-rainfall areas of Australia by dry-farming methods.** *Australian Journal of Science*, Sydney, 14(2):42–46, Oct. **1951.** **DLC**—At a conference of the

Agriculture and Forestry Section of the ANZAAS at Brisbane in 1951, discussions on climatology in relation to agriculture, soil water changes and other factors were held. PROF. G. W. LEEPER discussed various formulas for correlating climatic (rainfall) factors with crop growth, etc. and C. E. HOUNAM discussed the determination of the end of the growing season by Rainfall-Evaporation Decline curves, and tests carried out at Rutherglen Experiment Farm, Victoria. *Subject Headings:* **1. Agricultural climatology 2. Rainfall-Evaporation Decline 3. Conferences 4. Victoria, Australia. I. Leeper, G. W. II. Hounam, C. E. III. ANZAAS. Agriculture and Forestry Section.**—*M.R.*

MISCELLANEOUS APPLICATIONS

SOLAR INFLUENCES

(*See also items:* 3.11–75, 3.11–202)

3.11–256 551.590.21:551.524.7:551.510.53

Becker, Ferdinand, **Erwärmung der Stratosphäre durch solare Eruptionen (Vorläufige Mitteilung).** [Warming of the stratosphere by solar eruptions (advance communication).] *Annalen der Meteorologie*, 4(10–12):487–492, **1951.** 11 refs. 2 figs. (fold. in pocket). **DWB**—Six-hourly thicknesses 300–1000 and 100–200 mb in Hanover and Schleswig 1949–50 were compared with solar activity, magnetic character figures and height of F2 layer. Thickness of 100–200 mb showed positive correlation with chromospheric eruptions (faculae) and associated wave and particle radiation and radio fading; sudden eruptions were quickly followed by warming of the stratosphere but mechanism of relation is not yet clear. *Subject Headings:* **1. Solar influences 2. Temperature of the stratosphere.**—*C.E.P.B.*

3.11–257 551.590.21:550.385(411)

McIntosh, D. H., **Geomagnetic "sudden commencements" at Lerwick.** *Journal of Atmospheric and Terrestrial Physics*, London, 4(1):223–232, **1951.** 11 figs., 5 tables, 6 refs. **DWB**—Analyzing the occurrence of sudden commencements (S.Cs.) at Lerwick from April 1934 to Dec. 1949 author finds: 1) that the form of the S.Cs. have little if any connection with the following disturbances; 2) the amplitude of the main impulse of S.Cs. is related to some extent to the size of the following disturbances; 3) S.Cs. are more frequent during equinox than during winter and summer; 4) there is relation between the annual number of S.Cs. and (a) the mean annual sunspot number and (b) a measure of the annual magnetic activity; 5) attempts to correlate the definite variation in the form of S.Cs. according to time of occurrence with either the normal variation or the rate of change of normal variation on quiet or undisturbed days, are largely negative and 6) the average effect of the Lerwick S.Cs. is shown to be opposed to the main disturbance field. *Subject Headings:* **1. Magnetic storms 2. Solar influences 3. Geomagnetic activity 4. Sudden commencements 5. Lerwick, Scotland.** *From author's abstract.*

3.11–258 551.590.22:551.510.535

Burkard, Otto, **Studie zum ionosphärischen Gezeiteneffekt.** [Study of the tidal effect in the ionosphere.] *Journal of Atmospheric and Terrestrial Physics*, London, 1(5/6):349–352, **1951.** 5 figs., table, 5 refs. English summary p. 349. **DWB**—The semidiurnal lunar variation is well expressed during the daytime and extinguished during the night. Error calculations are given and the results are compared with the phase law of CHAPMAN. *Subject Headings:* **1. Ionosphere 2. Lunar variations 3. Lunar influences.**—*A.A.*

3.11–259 551.590.25:523.5(47)

Astapovich, I. S., **Bol'shoĭ Tungusskiĭ meteorit. II. Rezul'taty issledovaniĭ.** [The great Tungus meteorite. II. Results of investigation.] *Priroda*, Moscow, 40(3):13–23, March **1951.** 6 figs., 58 refs. **DLC**—This article contains a description of the meteorological conditions that prevailed when the great Tungus meteor fell on June 30, 1908, of the accompanying sound waves and their effects and of the atmospheric waves. *Subject Headings:* **1. Meteor influences 2. Tungus meteor.**—*I.L.D.*

OPTICAL PHENOMENA

3.11–260 551.593.11:551.524.4

Goverde, J. C., **Over het waarnemen van luchtspiegelingen.** [Observation of mirages.] *Hemel en Dampkring*, 50(2):34, 1952. fig. **MH-BH**—With the aid of diagrams, the author describes a mirage regularly observed and apparently due to a temperature inversion. *Subject Headings:* **1. Mirages 2. Temperature inversions 3. Netherlands.**—*I.L.D.*

3.11–261 551.593.11:551.510.3

ten Kate, H., **Fata Morgana.** *Hemel en Dampkring*, 50(2):32–34, 1952. fig. **MH-BH**—The author gives a simple explanation of the physical and optical basis of the mirage known as Fata Morgana and illustrates its optical basis by means of a diagram showing several homogeneous layers of air of different densities which form an angle with the surface, with the resulting refraction of light rays penetrating through these air layers. *Subject Headings:* **1. Fata Morgana 2. Air density 3. Netherlands.**—*I.L.D.*

3.11–262 551.593.5

Dubois, Jean, **Contribution à l'étude de l'ombre de la terre. Deuxième partie.** [Contribution to the study of the shadow of the earth. Pt. 2.] *Annales de Géophysique*, 7(3):145–168, July–Sept. **1951.** 3 figs., 12 tables, 26 refs., 20 eqs. French and English summaries p. 145. **MH-BH**—In this second part, the author calculates the brightness of anti-crepuscular sky (in a vertical plane holding the sun), in function of the height above the horizon of observed spot, and for several values of solar depression. For all these calculations (unfolded in a particular case), it is considered: the atmospheric absorption by molecular diffusion (it is supposed a very clear atmosphere, without dust, that occurs when observer stands on high mountain, for example, at the Pic du Midi Observatory); the selective absorption by ozone; eventually, the absorption by water vapor. Results of these calculations are tabulated, and, for the particular case that we consider here, we give curves showing the variation of the brightness of the sky in function of the height of the observed spot. These curves are like the curves given by observations of the earth shadow, and, consequently, the fact that the phenomenon of anti-crepuscular arch is caused by ozone selective absorption is corroborated. *Subject Headings:* **1. Sky brightness 2. Atmospheric absorption 3. Earth's shadow.**—*Author's abstract.*

3.11–263 551.593.54

Ångström, Anders, **The blue sun of September 1950.** *Tellus*, 3(3):135–140, Aug. **1951.** fig., 2 tables, 10 refs. **MH-BH**—A complete list of reports of the "blue sun" from Swedish meteorological stations and the results of actinometric measurements made several days after the first appearance of the blue sun are given. Measurements of total radiation together with measurements with the aid of red and yellow filters indicate that the blue color of the sun could have arisen through the scattering and absorption by a cloud layer containing particles larger than those present in clear atmosphere. It is shown that the blue color of the sun as well as other phenomena such as green sun, green moon, etc., can be explained as an integral effect of refraction rings produced with different elements of the sun's disk as centers and that an abnormal transmission of blue light has taken place. The origin of the particles is attributed to Canadian forest fires and perhaps also to the presence of volcanic dust. *Subject Headings:* **1. Blue sun 2. Smoke pall—Sept. 1950 3. Sweden.**—*I.L.D.*

3.11–264 551.593.54

Baumbach, S., **Die Erklärung der roten und der blauen Sonne.** [The explanation of red and blue sun.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 35:228–232, **1952.** 5 figs., 9 refs. **MH-BH**—Absorption coefficients for different kinds and sizes of particles are calculated for different wave lengths. With very small particles it varies with λ^{-4}. With large particles it is independent of λ. Intermediate homogeneous particles may absorb proportional to λ^2, and give a blue sun. *Subject Headings:* **1. Blue sun 2. Dust haze.**—*C.E.P.B.*

3.11–265 551.593.54

The blue sun of September 1950. *Nature*, London, 170(4316):103, July 19, 1952. **DWB** —Summary of literature on nature of the particles forming the smoke haze. *Subject Heading:* **1. Blue sun.**—*C.E.P.B.*

3.11–266 551.593.7

Robley, R., **La diffusion multiple dans l'atmosphère déduite des observations crépusculaires.** [Multiple diffusion in the atmosphere calculated from twilight observations.] *Annales de Géophysique*, 6(3):157–163, July–Sept. 1950. 11 figs., 6 tables, 13 refs., eqs. **MH-BH** —In the first part, multiple diffusion is investigated by means of a study of the polarization of the zenithal light of the twilight sky at the Pic du Midi Observatory. An analysis of the results indicates that the polarization does not vary appreciably during the year for the same angle of solar depression, that no dissymmetry is revealed between evening and morning observations and that all polarization curves are distinguished by the presence of a level stretch between 8°30′ and 11°. The second part deals with spectrophotometric observations of polarization of different wave lengths. It is found that for the same angle of solar depression the proportion of polarized light increases with higher wave length and that the polarization curves do not fall in the same way for all wave lengths. *Subject Headings:* **1. Polarization 2. Spectrophotometric observations.**—*I.L.D.*

3.11–267 551.593.7:551.593.53

Tcheng, Mao-lin, **Étude spectrophotométrique de la polarisation de la lumière du ciel bleu au zénith de 3050 à 4500Å.** [Spectrophotometric study of the polarization of the light of the blue sky at the zenith from 3050 to 4500Å.] *Annales de Géophysique*, 7(3):137–144, July–Sept. 1951. 5 figs., 2 tables, 9 refs. **MH-BH**—By the aid of photographic spectrophotometry the author measured the proportion of polarization of the light of the blue sky at the zenith for different heights of the sun and for radiation of 3050–4500Å interval, at Arosa. The comparison of the degree of polarization $P=\frac{I-I'}{I+I'}$ of monochromatic radiation shows that it increases with wave length and the zenithal distance of the sun. *Subject Headings:* **1. Polarization 2. Spectrophotometry 3. Zenith sky light.**—*Author's abstract.*

ATMOSPHERIC ELECTRICITY

(*See also items:* 3.11–133, 3.11–134, 3.11–181, 3.11–249)

3.11–268 551.594:551.555.8

Hartke, W., **Elektrische Raumladungen bei Sandstürmen.** [Electric charges in sandstorms.] *Umschau*, Frankfurt a.M., 51(3):89, Feb. 1951. 2 figs. **DLC**—Dust particles and grains of sand of different origin and material were positively and negatively charged during storms. The electric charge of sand is held responsible for the information and shape of dunes. Human and animal reactions are mentioned as indicating the effect of electricity conveyed by sand storms. *Subject Headings:* **1. Sandstorms 2. Electrical charges 3. Sand dunes.**—*G.T.*

3.11–269 551.594.1

O'Donnell, George A., **Electric conductivity and small ion concentration of the atmosphere at one metre above ground and conductivity at ground level.** *Journal of Atmospheric and Terrestrial Physics*, 2(4):201–215, 1952. 11 figs., 3 tables, 15 refs. **MH-BH, DWB**— Observations of numbers of positive and negative small ions per cc, and of positive and negative conductivity at ground level and 1 m were made throughout 24 hr on several days at 5 places in and up to 120 mi from New York. Conductivities at ground and 1 m differed and ratio varied through the day and with weather conditions. They depend on concentration of small ions and on their average mobility; rate of formation varies at the two levels in a different way. Results are related to diurnal variation of convection; at Easthampton on the coast turbulence is also important. *Subject Headings:* **1. Electrical conductivity of air 2. Ion mobility 3. Ionization 4. New York.**—*C.E.P.B.*

3.11–270 551.594.11:551.575

Chalmers, J. Alan, **Negative electric fields in mist and fog.** *Journal of Atmospheric and Terrestrial Physics*, London, 2(3):155–159, **1952.** fig., table, 6 refs. **DWB**—Measurements near Durham with simple apparatus carried by auto in fine misty weather in Oct. 1951, gave nearly always large negative fields. These extended at least 3 km downwind, especially along valleys, from high tension cables. They are attributed to negative currents of microampere strength liberated at pylons. *Subject Headings:* **1. Electrical conductivity of air 2. Fog.**—*C.E.P.B.*

3.11–271 551.594.11:551.586:612

Courvoisier, Peter, **Die Schwankungen des elektrischen Feldes in der Atmosphäre und ihre Bedeutung für die Meteoropathologie.** [The variations of the electrical field in the atmosphere and their importance in meteoropathology.] *Experientia*, Basel, 7(7):241–254, July 15, **1951.** 5 figs., 7 eqs., numerous foot refs. In German, English summary p. 254. **DWB**—As causes of weather sensitivity changes of ozone due to turbulence are too slow especially in penetrating closed houses. Pressure variations acting through the ear are unlikely to be effective. Variations of electric field, from 11 years down to ultraviolet frequency are always present; these are summarized in a diagram and the different wave bands discussed, including method of comparable measurement. The pathological effects of these variations are not yet known, and controlled experiments with artificial field oscillations are proposed. *Subject Headings:* **1. Potential gradient 2. Weather sensitivity.**—*C.E.P.B.*

3.11–272 551.594.12:551.558.1:551.551

Norinder, Harald and Siksna, Reinhards (*Univ. of Uppsala*), **Height variations in the concentration of ions near the ground during quiet summer nights at Uppsala.** *Tellus*, 3(4): 234–239, Nov. **1951.** 7 figs., 24 refs. **MH-BH**—The results of measurements of the concentration of small and large ions are given. The nocturnal variations are illustrated, and explanations of these variations are outlined. The nocturnal variation is quite different for small and for large ions. The concentration of small ions increases during the night, and the concentration of large ions decreases at this time, followed by a rapid increase after sunrise. The prime cause of the increased ionic density during the night might be the accumulation of emanation exhaled from the soil into the air layers during reduced turbulence of the air. Large ions, on the contrary, may be considered as a fraction of condensation nuclei. The diurnal variation in nuclei density shows a maximum in the forenoon and in the evening with a minimum prior to sunrise. This fact may be connected with the daily convective cycle. *Subject Headings:* **1. Atmospheric ions 2. Atmospheric turbulence 3. Convection 4. Uppsala, Sweden.**—*A.A.*

3.11–273 551.594.18

Guizonnier, R., **Lien entre le gradient de potentiel électrique terrestre, l'humidité relative et la température.** [Relation between the surface gradient of atmospheric electricity, the relative humidity and temperature.] *Ciel et Terre*, 67(7/8):140–141, July/Aug. **1951. DWB**—A note based on summaries of data collected at Ebro, Spain, and Batavia, Java (1929 and 1931). Conclusion is that if temperature variation is slight, the potential gradient follows the curve of relative humidity (which parallels the daily global radiation cycle), and if the humidity changes little, the gradient follows the march of temperature. The relation $\Delta G/\Delta t$ is fairly constant (10 *v*/degree) between 50° and 30°C. *Subject Headings:* **1. Potential gradient 2. Temperature effects 3. Humidity effects.**—*M.R.*

3.11–274 551.594:551.584.61

Israël, Hans and Kasemir, H. W., **Ueber die Schirmwirkung von Gebäuden auf die Schwankungen des atmosphärisch-elektrischen Feldes.** [On the influence of buildings on the variations of the atmospheric-electric fields.] *Annales de Géophysique*, 7(1):63–68, Jan.–March **1951.** 2 figs., 5 refs., 24 eqs. French and English summaries p. 63. **MH-BH**—A method of calculation of the reduction of electric fields of varying frequency in traversing a building with poor conductivity was devised and tested to determine whether electric conditions are the same indoors as out. Useful in meteoropathologic experiments. Effects on dust,

humidity and ionization in rooms are suggested. The shielding depends entirely on the frequency of the field. At high frequencies the shielding is complete—at very low frequencies (daily waves of magnetic field) the shielding is very slight. *Subject Headings:* **1. Atmospheric electricity 2. Indoor climates.**—*M.R.*

3.11–275 551.594.11

Kasemir, H. W., **Studien über das atmosphärische Potentialgefälle V. Zur Strömungstheorie des luftelektrischen Feldes II.** [Studies on atmospheric potential gradient V. On the current theory of the atmospheric electric field II.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 5(1):56–70, **1952.** 6 figs., 34 eqs., 5 refs. German, English and French summaries p. 56–57 **DWB**—(For Pt. I *see item* 2.2–159, Feb. 1951, *MAB.*) Here nonprecipitating clouds, haze and fog layers are regarded as ellipsoids of rotation with constant internal conductivity in a homogeneous vertical current field, and the field and currents within and outside the ellipsoids are examined. They depend on the conductivity and shape of the body. The two extremes are an infinite layer (current inside and out equal) and an infinite cylinder (current proportional to conductivity). Results are applied to potential gradient on shore of or over a lake. *Subject Headings:* **1. Potential gradient 2. Atmospheric conductivity.** —*C.E.P.B.*

3.11–276 551.594.2:551.575

Israël, Hans and Kasemir, H. W., **Studien über das atmosphärische Potentialgefälle VI. Beispiele für das Verhalten luftelektrischer Elemente bei Nebel.** [Studies on atmospheric potential gradient VI. Examples of the behavior of atmospheric electric elements during fog.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 5(1):71–85, **1952.** 8 figs., 6 refs. German, French and English summaries p. 71–72. **DWB**—Effect of fog is treated as a local disturbance and examined by records at 2 lowland stations (Buchau, Uppsala) and 2 mountain (Jungfraujoch, Sonnblick). Two types are distinguished according as field and vertical current have the same or opposed directions. In an extensive lowland fog the field increases while current remains unchanged; in mountain cumulus the field is unchanged but the current decreases, both showing a decreased conductivity. *Subject Headings:* **1. Potential gradient 2. Atmospheric conductivity.**—*C.E.P.B.*

AURORAS

3.11–277 551.594.5:551.510.535

Vegard, Lars, **Nouveaux résultats importants dans l'étude de spectre des aurores boréales et la physique de l'ionosphère.** [New important results in the study of the spectrum of the aurora borealis and physics of the ionosphere.] *Annales de Géophysique*, 6(3):157–163, July–Sept. **1950.** fig., 2 tables, 4 refs. French and English summaries p. 157. **MH-BH**—A new spectrograph with two prisms and with an opening F/1.2 was used to study an aurora that appeared Feb. 23–24, 1950. Fifty-four new atomic lines in the region 3900–6300Å were observed. The presence of molecular O_2 was demonstrated. A large number of lines were shown to be produced by nitrogen and oxygen atoms in the neutral and ionized state. The rotational components of the R-branch of the band 3914 appeared separated so that a more accurate determination of the auroral temperature, namely, −54°C, could be made. *Subject Headings:* **1. Auroral spectra 2. Ionosphere.**—*From author's abstract.*

3.11–278 551.594.51(04)

Gerson, N. C. (*Air Force Cambridge Research Center*), **The Colloquium on auroral physics.** *Franklin Institute, Philadelphia, Journal*, 253(4):331–338, April **1952.** **DLC**—The colloquium was held at London, Ontario on July 27–28, 1951 under the joint sponsorship of the Geophysics Research Division of the Air Force Cambridge Research Center and the University of Western Ontario. The author presents a concise but informative summary of the discussion of the four sessions. The first session, with B. Friedman as chairman, was on "Electromagnetics as applied to auroral problems" and covered the following topics: "(a) the passage of a neutral stream of ionized matter from the sun towards the earth; (b) the interaction of this neutral plasma with the geomagnetic field to cause a ring current (and the early and late phases of

magnetic storms); and (c) the subsequent movement of charges along the magnetic lines of force towards the terrestrial atmosphere eventuating in the observed luminosities." The theories of CHAPMAN and FERRARO on auroras and magnetic storms and MARTYN's extension of these theories were reviewed and MALFORS' experiment on the terrella was described. R. W. B. PEARSE was moderator of the second session which discussed "Interpretation of auroral and airglow spectra." The molecular spectra and atomic lines possibly present in the auroral spectra were considered as they relate to the composition of the ionosphere (80–400 km) and mesosphere (400–1000 km). Conclusions are drawn as to the positive existence of certain bands and lines and doubtful existence of others. "Quantum mechanics as applied to auroral problems" was the subject of the third session presided over by TA-YOU-WU. "This meeting considered the vitally important but very much neglected field of cross sections for collision of atomic, molecular, and ionized particles found in the ionosphere and mesosphere (a) to each other and (b) to the auroral bombarding particles." The fourth session was under the chairmanship of D. R. BATES. "Laboratory investigations of mesospheric processes" was the topic. In this session various experiments which have been undertaken, or are planned, to study various processes in the ionosphere and mesosphere were explained. *Subject Headings:* **1. Auroral physics 2. Symposia.**—*M.L.R.*

PART II. SELECTIVE ANNOTATED BIBLIOGRAPHY ON ATMOSPHERIC TURBULENCE AND "BUMPINESS" IN FLIGHT

By: *Mollie P. Kramer* and *Malcolm Rigby*

EXPLANATORY NOTE

The vast amount of literature on turbulence has necessitated our separating the material in this field into three bibliographies, the first of which appears below. The second and third will be published shortly in *Meteorological Abstracts and Bibliography*. Subject matter has been divided as follows:

No. 1—Selected papers on the theory of atmospheric turbulence, **high level clear air turbulence,** and applications of atmospheric turbulence at all levels to flight.

No. 2—Papers on the **statistical theory of turbulence** and accounts of laboratory and wind tunnel experiments.

No. 3—**Micrometeorological turbulence, turbulent diffusion** and **turbulent exchange.**

One of the most keenly debated questions in modern meteorology is that of the origin and explanation of small scale irregularities of flow encountered by airplanes flying in the upper troposphere and the stratosphere. Meteorologists disagree on the subject to such an extent that some define the phenomenon as high level "atmospheric turbulence" to which the Richardson criterion may be applied, while others prefer to call it "bumpiness" caused by abrupt changes in air speed experienced by airplanes flying through some region of discontinuity such as the jet stream or tropopause. In preparing this bibliography we have included papers representative of both schools of thought; an attempt has been made to separate the second category from the first in the *Subject Outline* below by the inclusion of such headings as "bumpiness" and "turbulence associated with discontinuity surfaces." Types of atmospheric turbulence affecting flight below approximately 10,000 ft have been classified as thunderstorm turbulence, turbulence in other convective clouds, frontal turbulence, orographic turbulence and general low level turbulence associated with eddy motion, vertical currents and gustiness in the frictional layer.

A few outstanding theoretical papers which were considered especially applicable to atmospheric turbulence rather than to other aspects of turbulence have been included. Turbulence theory will be covered thoroughly in ensuing bibliographies (Nos. 2 and 3 mentioned above).

The asterisk (*) is used to denote a good source of data, the dagger (†) a good source of references and the symbol (§) a good synoptic study. The library abbreviation WB-AS identifies those papers available at the Weather Bureau, Washington National Airport Station and not available, to our knowledge, at the better known libraries. Entries marked DNACA may be found at the library of the National Advisory Committee for Aeronautics, 1724 F St., N.W., Washington, D. C.

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ATMOSPHERIC TURBULENCE AND "BUMPINESS" IN FLIGHT

1883

3K–1 532.5:551.551

Reynolds, Osborne, **An experimental investigation of the circumstances which determine whether the motion of water shall be direct or sinuous, and of the law of resistance in parallel channels.** *Royal Society of London, Philosophical Transactions*, 174(3):935–982, **1883.** 9 figs., 5 tables. Also in his **Papers on Mechanical and Physical Subjects.** v. II. Cambridge, **1901.** p. 51–105. **DLC**—The most significant paper in the field of turbulence theory. Proved that there is a critical velocity which determines whether motion of a fluid will be laminar or turbulent and that the critical velocity decreases as temperature of the fluid increases. Developed a theory to explain why eddies are responsible for the variation of resistance as the square of the velocity. Explanation was deduced from experiments with (1) eddies in water, the surface of which was covered with oil to prevent waves, (2) colored streaks in water flowing through glass tubes of various sizes and (3) observation of waves and eddies formed on the boundary surface between two opposite moving streams in a tube. Results given in extensive tables. REYNOLDS also showed that there were really two critical velocities, one for change from laminar to turbulent flow, and a similar one for change from turbulent to stable flow. The equations of motion were developed to formulate the experimental laws, and the methods of setting up the experiments described in detail and the equipment illustrated. DARCY's experiments on resistance to turbulent flow in pipes are described and verified. Note: Eddy or sinuous motion is mentioned often, but no reference is made to turbulent motion. *Subject Headings:* **1. Turbulence theory 2. Boundary layer 3. Equations of motion 4. Fluid dynamics.**—*M.R.*

1893

3K–2 551.551

Langley, Samuel Pierpont, **The internal work of the wind.** *Smithsonian Contributions to Knowledge*, 27(2), **1893.** 23 p. 3 figs., 5 plates. **DLC.** French ed.: **Le travail intérieur du vent.** *Revue de l'Aéronautique*, **1893. DLC**—The pulsating, ascending, lateral and whirling motions of the wind are discussed and illustrated by graphs of anemometer readings showing extreme gustiness (for every 25 revolutions) July 16, 1887 at Allegheny Observatory and every revolution at Washington, D. C., Jan. 14, 1893, SE wind, cloudy, and Feb. 4, 1893, NW wind and Feb. 20, NW wind—every 5 revolutions of the aluminum cups. *Subject Headings:* **1. Atmospheric turbulence 2. Wind structure.**—*M.R.*

1912

3K–3 551.551:629.13

Humphreys, William Jackson, **Holes in the air.** *Popular Science Monthly*, 81:50–60, July **1912.** photo. **DWB**—The updrafts, downdrafts, "cascades," eddies, air layer interfaces and other meteorological conditions causing the unscientifically named phenomena of "holes in the air" are discussed. *Subject Headings:* **1. Atmospheric turbulence 2. Aeronautical meteorology.**

3K–4 551.551

Linke, Franz and collaborators, **Windbewegungen in der Nähe des Bodens, Böigkeit des Windes.** [Wind oscillations near the ground, gustiness.] *Wissenschaftliche Gesellschaft für Flugtechnik, Jahrbuch*, Berlin, 1(1):45–69, **1912–13.** 4 figs., eq. **DLC**—A discussion of the four types of atmospheric disturbances affecting flight, low level turbulence, wave motion in the air, gusts and thunderstorms, and so-called air pockets. Introductory remarks by Linke are followed by numerous shorter contributions and finally a discussion by ASSMANN and LINKE of those contributions. *Subject Headings:* **1. Turbulence in the frictional layer 2. Aeronautical meteorology.**

3K–5 551.551:629.13

Starrett, D. W., **Simple explanation of air holes.** *Aircraft*, New York, 2(12):396, Feb. **1912. DLC**—An early note on the thesis that an air hole or pocket is merely an area where there is a descending current or a wind in the direction of movement of the plane. *Subject Headings:* **1. Clear air turbulence 2. Vertical currents.**—*M.R.*

1914

3K–6 551.551

Harries, Henry, **Eddy winds of Gibraltar.** *Royal Meteorological Society, Quarterly Journal*, 40(169):13–31, Jan. **1914.** 13 figs. **DWB**—The anemometer on the summit of the Rock showed abnormal turbulence with an east wind striking the nearly vertical face. The wind currents were traced by releasing bunches of wool, by small balloons, both tethered and free, and by smoke from fires. Conflicting winds in the Bay and harbor were also plotted. The results were most remarkable,

and are shown diagrammatically, differing in scale according to the wind force. *Subject Headings:* **1. Turbulence in the frictional layer 2. Atmospheric eddies 3. Gibraltar.**—*C.E.P.B.*

1915

3K–7 551.551

Taylor, Geoffrey Ingram, **Eddy motion in the atmosphere.** *Royal Society of London, Philosophical Transactions, Ser. A*, 215:1–26, **1915.** 5 figs., 3 tables, refs., 20 eqs. **DLC**—The effect of eddies on the lapse rate of wind, temperature and moisture are taken up in theory and the theory applied to the eddy transfer of heat, moisture and momentum over the sea in the vicinity of the Grand Banks of Newfoundland. Observations were made in the summer of 1913 with kites and the trajectories of air particles and lapse rates determined on 6 different occasions. Finally, the coefficient of eddy conductivity was determined for each case and compared with other results—over land, in solids, etc. *Subject Headings:* **1. Turbulence theory 2. Atmospheric turbulence.**—*M.R.*

1917

3K–8 551.551:551.501.7

Wenger, Robert, **Die Steigegeschwindigkeit der Gummiballone und die Turbulenz in der Atmosphäre.** [The ascension rate of rubber balloons and atmospheric turbulence.] *Annalen der Hydrographie und Maritimen Meteorologie*, 45(4):121–137, **1917.** 8 figs., 5 tables, refs. **DLC**—The effect of turbulence on balloon ascension has hitherto been neglected by all authors, such as DE QUERVAIN, HERGESELL, HESSELBERG and BIRKELAND, but according to investigations shown in this article the balloon rises much more rapidly in turbulent air than it does in quiet air. According to the author, ascension rates of balloons cannot be used as a guide to the vertical velocities of air, since all of the variation in rates of ascent can be explained by turbulence. The sudden decrease of resistance ψ with increasing Reynolds number from R = 200,000 to 260,000 and then a slight increase and levelling off to R = 400,000 is shown. The effect on ascension rate is illustrated schematically (after PRANDTL) and mathematically. HESSELBERG's observations are used to show the correlation between R and ψ. The two kinds of turbulence are evident from the appearance of two clusters of data—one for low and one for high R. Using the departures of the ascension rates from the average (Lindenberg two-theodolite observations) as an index of the degree of atmospheric turbulence, the author concludes that (1) a discontinuity in turbulence conditions occurs at 15–18 m/s wind speed; (2) turbulence increases with increasing wind speed, with decreasing change in direction of wind with height (except when wind speeds are low), with increasing temperature lapse rate. *Subject Headings:* **1. Clear air turbulence 2. Balloon ascension rates 3. Vertical currents. I. Leipzig. Geophysical Institute II. Hesselberg, T. III. Prandtl, Ludwig.**—*M.R.*

1918

3K–9 551.551

Molchanov, P., **Nekotoryia dannyia o strukture vozdukha nizhnikh sloev atmosfery.** [Information on the structure of the wind in the lower layers of the atmosphere.] Leningrad, **1918.** 23 p. 2 figs., 5 tables, refs., 5 eqs. **DWB**—Part of a course in meteorology for the school of aerial navigation of the Russian Admiralty. Data on the ascension rate of various sizes of pilot balloons are analyzed and discussed in respect to the information these data give on the magnitude and frequency of vertical currents and turbulence. Inferences are made as to the origin of cumulus and cumulonimbus clouds. The work is based mainly on theoretical studies of HESSELBERG, WENGER and HERGESELL. *Subject Headings:* **1. Turbulence in the frictional layer 2. Vertical currents 3. Balloon ascension rates.**—*M.R.*

3K–10 551.551 551.554

Taylor, Geoffrey Ingram, **Phenomena connected with turbulence in the lower atmosphere.** *Royal Society of London, Proceedings, Ser. A*, 94(658):137–155, **1918.** 7 figs., 4 tables, refs. **DLC**—Using 5 years of temperature observations made on the Eiffel Tower in Paris at 18, 123, 197 and 302 m above the ground, the author computes values of K along the same lines as he did in the 1915 (see item 3K–7 above) paper for the Grand Banks of Newfoundland and Salisbury Plain (pibal observation). He found K to be of the order of 10×10^4, but varying with seasons and height above ground—much greater than over the sea (3×10^3), but of the same order as from pilot balloon observations at Salisbury Plain (5×10^4). HELLMANN's observations at Potsdam at 2, 16 and 32 m are compared and found to agree essentially. *Subject Headings:* **1. Atmospheric turbulence 2. Wind profiles.**—*M.R.*

1919

3K–11 551.551 551.554

Jeffreys, Harold, **On the relation between wind and distribution of pressure.** *Royal Society of London, Proceedings, Ser. A*, 96(A676):233–249, Oct. **1919.** 3 tables, eq. **DLC**—From wind

direction and velocity data obtained from 600 observations over the North Sea, it was concluded that deviations from the gradient winds could only be accounted for by an increase in the coefficient of turbulence with height. *Subject Headings:* **1. Atmospheric turbulence 2. Wind profiles 3. North Sea.**—*M.R.*

1920

3K–12 551.551 551.554

Brunt, David, **Internal friction in the atmosphere.** *Royal Meteorological Society, Quarterly Journal*, 46(194):175–185, **1920.** fig., refs., 24 eqs. **DLC**—Frictional forces which cause a loss of momentum and a consequent veering of the wind with height, are considered theoretically, and an attempt made to rationalize the results of numerous observations made at Paris, Lindenberg and other places in Europe, America and on the Atlantic Ocean, with this theory or vice-versa. It was concluded that K must vary with height. Discussion by WHIPPLE, DINES and GIBLETT, and reply by BRUNT appended. *Subject Headings:* **1. Turbulence theory 2. Wind profiles 3. Turbulence in the frictional layer.**—*M.R.*

3K–13 551.551

Richardson, Lewis F., **The supply of energy from and to atmospheric eddies.** *Royal Society of London, Proceedings, Ser. A*, 97:354–373, **1920.** fig., 2 tables, refs., eqs. **DLC**—This paper extends OSBORNE REYNOLD's theory of the criterion of turbulence, to make it apply to the case in which work is done by the eddies acting as thermodynamic engines in a gravitating atmosphere in which the air is assumed to be dry. The gist of the solution is contained in equation No. 4.15 (expressing the average rate at which intrinsic and gravitational energy jointly are being transformed into the energy of eddies) and equation No. 5.3 (equation which results when the convective activity given by equation No. 4.15 and the REYNOLD's expression for the supply of energy from the mean wind, equation No. 2.3, are inserted in the equation of continuity, in the form of equation No. 1.10). Some analogies to thermodynamics are introduced, including the conception of an eddy-heat-per-mass, and its diminution when the air expands. *Subject Headings:* **1. Turbulence theory 2. Richardson criterion 3. Atmospheric eddies.**—*From author's introduction.*

3K–14 551.551:551.588.2

Varney, Burton M., **Daytime wind turbulence in a mountain valley.** *Monthly Weather Review*, 48(6):336–337, June **1920.** fig. **MH-BH**—Observations of the flight of pieces of paper led to the discovery of huge spirals indicative of daytime turbulent wind flow in a deep valley in Yosemite National Park. *Subject Headings:* **1. Orographic turbulence 2. Yosemite National Park, Calif.**

1921

3K–15 551.551:551.506

*Bingel, Fr., **Turbulenz und Vertikalströme in der freien Atmosphäre. Teil 1–2.** [Turbulence and vertical currents in the free atmosphere. Part 1–2.] *Annalen der Hydrographie und Maritimen Meteorologie*, 49(7–8):209–220, 248–257, **1921.** figs., 15 tables, 17 refs. **DWB, DLC**—It was found after much experimenting that more accurate and controllable soundings could be made with falling than with ascending balloons, for studies of turbulence and vertical velocities in the lower layers (1000 ft) of the atmosphere. Results of about 100 such pilot balloon soundings, some with one and some with two balloons, are tabulated. The departures from normal rate of fall are used to determine the vertical motion and turbulence degree, and the cloud conditions and prevailing weather are correlated with the turbulence conditions. Results compared with those of Postelmann in Sofia. *Subject Headings:* **1. Turbulence in the frictional layer 2. Vertical velocity 3. Dropsondes 4. Turbulence measurement 5. Lindenberg, Germany.**—*M.R.*

3K–16 551.551

Defant, Albert, **Messungen der atmosphärischen Turbulenz und Energieumsatz bei atmosphärischen Turbulenzwirbeln.** [Measurement of atmospheric turbulence and energy exchange in atmospheric eddies.] *Meteorologische Zeitschrift*, 38(9):268–274, Sept. **1921. DWB**—A report on the work of L. F. RICHARDSON on measurement of atmospheric turbulence and on the supply of energy from and to atmospheric eddies (*see* 3K–13 above). Also reviews work of W. SCHMIDT on Massenaustausch (1918). *Subject Headings:* **1. Turbulence measurement 2. Atmospheric eddies 3. Energy exchange.**—*M.R.*

1922

3K–17 551.551

Stevens, Catharine O., **Telescopic observation of atmospheric turbulence.** *Nature*, London, 110(2756):280, Aug. 26, **1922. DLC**—Author contradicts HUMPHREYS, who in "Physics of the air"

(Chap. 11, 12 and 14, 1st ed., 1920), discusses turbulence at the boundary of two adjacent air masses, and states that visual evidence of turbulence is only to be found when humidity conditions are such as to produce condensation. She claims that 20 years of personal observation convinces her that billows in the free air and their orientation are clearly visible at all times by optical means and not necessarily due to presence of clouds. *Subject Headings:* **1. Frontal turbulence 2. Clear air turbulence.**—*M.R.*

1923

3K–18 551.551:551.510.42

Dobson, G., **Measurements of turbulence in the atmosphere by the spreading of a smoke trail.** *Great Britain. Aeronautical Research Committee, Technical Report of the Advisory Committee for Aeronautics*, 1919, 1:68–69, **1923**; *Reports and Memoranda*, No. 671, Nov. **1919.** 3 figs., refs. **DLC**—The diffusion of smoke is pictured for various values of K (eddy conductivity) assuming a wind velocity of 10 m/sec. Photos of observed turbulence are compared with computed values. *Subject Heading:* **1. Turbulence measurement.**

3K–19 551.551

Geddes, A. E. M., **Some notes on atmospheric turbulence.** *Royal Meteorological Society, Quarterly Journal*, 49(205):1–2, Jan. **1923.** 4 photos. **DWB**—Examples of turbulence shown in smoke from tall chimneys, also at the base of a line squall cloud and roll cloud, all at Aberdeen, Scotland. *Subject Headings:* **1. Turbulence in the frictional layer 2. Aberdeen, Scotland.**—*C.E.P.B.*

3K–20 551.551

Nordmann, Charles, **La "turbulence" du vent et du vol des oiseaux voiliers.** [Turbulence of the wind and soaring of birds.] *Académie des Sciences, Paris, Comptes Rendus*, 188(20):944–947, Nov. 12, **1923.** 8 refs. **DWB**—A note attempting to settle the argument carried on by mathematicians for 50 years, as to whether a bird can maintain its altitude by tipping its wings at an angle to take advantage of the gusts and lulls. The author maintains that such gusts are too frequent for the bird to keep up with, and despairs of being able to formulate turbulence conditions mathematically to prove or disprove the theory. No mention is made of prolonged vertical currents as a source of energy for soaring. *Subject Headings:* **1. Clear air turbulence 2. Gustiness 3. Soaring of birds.**—*M.R.*

1924

3K–21 551.551

Friedmann, A., **Über atmosphärische Wirbel und die Turbulenz des Windes.** [Atmospheric eddies and turbulence.] *Beiträge zur Physik der freien Atmosphäre*, 11(4):154–163, **1924.** 2 figs., ref., 27 eqs. **DWB**—Theoretical study of the relation between the horizontal and vertical components of turbulence and eddy streams in the atmosphere with special attention to the arrangement of such streams. *Subject Headings:* **1. Turbulence theory 2. Atmospheric eddies.**

1926

3K–22 551.551:629.13

Gregg, W. R., **Meteorological conditions along airways.** *U. S. NACA, Report*, No. 245, **1926.** 16 p. 8 figs., 7 tables, 8 refs. **DLC**—Average wind velocities at various levels from surface to 13,000 ft along Chicago to Fort Worth airway are given in tables for each season, showing increase of wind with height. Effect of turbulence on flight (up to 6,000 ft) is mentioned, and diurnal variation in turbulence stressed. Seasonal variations are also apparent, as also are variations with direction of wind. The greater shear occurs in winter with westerly or northwesterly winds. In summer the speed sometimes decreases with height above 1600 ft. *Subject Headings:* **1. Turbulence in the frictional layer 2. Wind profiles 3. Aeronautical meteorology 4. Mississippi Valley.**—*M.R.*

3K–23 551.551:551.588.2

Koschmieder, Harald, **Die Luftströmungen um Berghindernisse in der freien Atmosphäre.** [Air currents over mountain obstacles in the free atmosphere.] *Beiträge zur Geophysik*, 15(3):285–303, **1926.** 12 figs., 15 refs. **DLC**—Theoretical discussion of two- and three-dimensional turbulence or air flow over and around hills or mountains. Measuring techniques described and results of measurements made by means of free or pilot balloons, kites and surface observations integrated with theoretical formulas. Effect of lapse rate, wind speed, etc., discussed. Lee effects nicely illustrated. *Subject Headings:* **1. Orographic turbulence 2. Turbulence measurement.**—*M.R.*

1929

3K–24 551.551:629.13

Durward, J., **Bumpiness on the Cairo-Basra air route.** *Great Britain. Meteorological Office, Professional Notes*, No. 52, **1929.** 6 p. fig., table. **DWB**—Bumpiness (turbulence) is tabulated

and discussed briefly for the section of the route from Cairo to Gaza, as well as for the other sections of the route to Bagdad and Basra. (*Same item as* 2J–122, Oct. 1951, *MAB.*) *Subject Headings:* **1. Atmospheric turbulence 2. Aeronautical meteorology 3. Arabia 4. Egypt 5. Iraq.**—*H.P.K.*

3K–25 551.551

Molchanov, P., **Die Struktur der Böen in der freien Atmosphäre.** [The structure of gusts in the free atmosphere.] *Beiträge zur Physik der freien Atmosphäre*, 16(2):152–155, **1929.** 7 figs. **DLC**—Brief illustrated account of the observation method and duration of upper air gusts. *Subject Headings:* **1. Clear air turbulence 2. Gustiness.**

3K–26 551.551

Molchanov, P., **Versuch zur Erforschung der Verteilung der Windböigkeit in den unteren Schichten der Atmosphäre.** [Attempt to determine the distribution of gustiness of the wind in the lower layers of the atmosphere.] *Beiträge zur Physik der freien Atmosphäre*, 16(1):43–56, **1929.** 13 figs., 3 tables, ref. **DWB**—A discussion of the basic types of gust distribution, synoptic situations with which they are associated, and their applications to flight. *Subject Headings:* **1. Atmospheric turbulence 2. Gustiness.**

3K–27 551.551:551.507.321.4

Peppler, Albert, **Über starke Vertikalböen in der freien Atmosphäre.** [On the strong vertical gusts in the free atmosphere.] *Beiträge zur Physik der freien Atmosphäre*, 16:115–130, **1929.** 6 figs., tables. **DWB**—The possible means of measuring vertical motion associated with turbulence or gustiness are outlined with emphasis on the use of the captive kite balloon. Height of the layer at which strong vertical gusts are found and associated wind and temperature conditions are discussed. In table I case histories of 31 gust occurrences are listed with information regarding height, wind direction (over, in, and under the layer), temperature gradient in the layer, cloudiness and any unusual characteristics of each case. *Subject Headings:* **1. Clear air turbulence 2. Gustiness 3. Turbulence measurement.**

1931

3K–28 551.551:629.13

*Rhode, Richard V. and Lundquist, Eugene E., **Preliminary study of applied load factors in bumpy air.** *U. S. NACA, Technical Note*, No. 374, April **1931.** 30 p. 6 figs., tables, 5 refs. **DLC**—Theoretical relationships between vertical currents, gusts and airplanes and the structure of the atmosphere are discussed briefly. Considerable acceleration data are included with the hope that study of such data may lead to a rational basis for structure design of airplanes. *Subject Headings:* **1. Atmospheric turbulence 2. Aircraft design 3. Gust loads.**

1932

3K–29 551.551:629.135

Blenk, Hermann, Hertel, Heinrich and Thalau, Karl, **The German investigation of the accident at Meopham (England).** *U. S. NACA, Technical Memorandum*, No.669, April **1932.** 30 p. 26 figs., table, 4 refs., eqs. (Originally in *Zeitschrift für Flugtechnik und Motorluftschiffahrt*, Berlin, 23(3):73–86, Feb. 15, **1932.**) **DLC**—The explanation of the accident advanced is that "the wing broke as a result of a violent gust or a too rapid pull-up out of an unintentional glide." The plane was flying at 1,000 ft through gusts estimated at about 30 ft/sec. *Subject Headings:* **1. Turbulence in clouds 2. Turbulence in the frictional layer 3. Gustiness 4. Aircraft accidents 5. Meopham, England. I. Vanier, J.** (*trans.*) **II. U. S. NACA.**

3K–30 532.5:551.551

Prandtl, Ludwig, **Meteorologische Anwendung der Strömungslehre.** [Meteorological applications of hydrodynamics.] *Beiträge zur Physik der freien Atmosphäre, Bjerknes-Festschrift*, 19:188–202, **1932.** 6 figs., refs., eqs. **DLC**—The basic concepts of turbulence, austausch, mixing length and viscosity are outlined simply and clearly. Then the influence of stability or temperature gradient and convection currents treated on the basis of theoretical and empirical studies. The influence of time and of the earth's rotation is next introduced and finally, the application to the general circulation at all latitudes and to trade wind circulation in particular, developed theoretically and schematic diagrams presented. *Subject Headings:* **1. Turbulence theory 2. General circulation 3. Stability 4. Wind profiles.**—*M.R.*

3K–31 551.551:551.507.352

Raethjen, P., **Die Luftunruhe in der freien Atmosphäre und ihre Beobachtung im Flugzeug.** [Turbulence in the free atmosphere and its observation from an airplane.] *Meteorologische Zeitschrift*, 49(2):62–67, **1932.** fig., refs. **MH-BH**—Hydrodynamic turbulence and atmospheric

turbulence are simply defined and the features which distinguish the latter from the former stressed. It is shown that gustiness encountered by airplanes may result from convectional currents or from turbulent flow of air. Further research in atmospheric turbulence using specially equipped airplanes is urged. *Subject Headings:* **1. Atmospheric turbulence 2. Aeronautical meteorology.**

3K–32 551.551:551.588.2

*Ziemer, Gerhard, **Über die Böigkeit des Windes in Bodennähe.** [Wind gustiness near the ground.] *Beiträge zur Physik der freien Atmosphäre*, 18(4):263–342, **1932.** 19 figs., tables, 9 refs., eqs. **DLC**—A most comprehensive, theoretical and empirical treatment of turbulence near the earth's surface, based on pilot balloon, airplane and surface observations made on mountains, etc. Diurnal effects, effects of temperature and wind lapse rates, air masses, topography, etc. treated in detail. Many graphs and nomograms prepared from aerological data are included, as well as tabular data on which the latter are based. *Subject Headings:* **1. Turbulence in the frictional layer 2. Orographic turbulence.**—*M.R.*

1933

3K–33 551.591:551.551

Albrecht, Fritz, **Theoretische Untersuchungen über den Strahlungsumsatz in Wolken.** [Theoretical investigations on radiation exchange in clouds.] *Meteorologische Zeitschrift*, 50(12):478–486, Dec. **1933.** 4 figs., 2 tables, 5 refs., 12 eqs. **MH-BH**—An investigation of visibility in clouds for various lengths of light waves. The author analyzes relation between density of clouds, diameter of drops and vision range, and also considers turbulence as important factor in visibility variations. (*Same item as* 3I–57, Sept. 1952, *MAB.*) *Subject Headings:* **1. Atmospheric turbulence 2. Visibility in clouds.**—*N.T.Z.*

3K–34 551.551:551.507.352

Jennings, W. G., Alston, B. A. and Howarth, C., **Investigation of atmospheric turbulence by aircraft carrying accelerometers.** *Great Britain. Aeronautical Research Committee, Technical Report for the year 1931*, 1:658–663, **1933;** *Reports and Memoranda*, No. 1441, Oct. 17, **1931.** 10 figs., 2 tables, ref. **DLC**—Accelerometer readings from four aircraft flying over England in varied weather were collected to serve as data from which to reckon load factors for design purposes. Maximum gusts of 30 ft/sec up and 15 ft/sec down were observed over the Northern Highlands. *Subject Headings:* **1. Atmospheric turbulence 2. Gust loads 3. Aircraft design 4. Great Britain.**

3K–35 551.551

†Köhler, Hilding, **Meteorologische Turbulenzuntersuchungen 1.** [Meteorological turbulence investigations. 1.] (*K.*) *Svenska Vetenskapsäkademien, Handlingar*, 13(1):**1933.** 54 p. 3 figs., 36 refs., 74 eqs. **DWB**—This paper comprises a good survey of progress in theoretical turbulence and applications to meteorological problems from Boussinesq (1877) to the work of Prandtl (1927) and Taylor (1932), including reference to most of the important studies. The equations of Reynolds and Lorentz are extended to include many aspects of the application of turbulence theory to 3-dimensional eddy motions in the atmosphere and to calculation of *austausch* coefficients. Frictional influences from molecular to large scale motion, boundary layer influences, surface and gradient wind, and shearing stress are considered theoretically. *Subject Headings:* **1. Turbulence theory 2. Atmospheric turbulence.**—*M.R.*

3K–36 551.551:551.506.7

*Mildner, Paul, **Über die Turbulenz des Windes beobachtet mit Hilfe von doppelt und einfach visierten Pilotballonen.** [On atmospheric turbulence determined by observing pilot balloons with double and single theodolites.] *Beiträge zur Physik der freien Atmosphäre*, 20:114–126, **1933.** 6 figs., 6 tables, 9 refs. **DWB**—Twenty-eight double and 54 single theodolite observations of consecutive pibal ascents over the Leipzig-Mockau airport are discussed. Wind direction and velocity data were recorded and correlated in an attempt to characterize turbulence quantitatively. Ascent velocity of the balloons was studied to determine vertical components of turbulence. Use of a single theodolite proved satisfactory for observing wind direction but inferior to the double for measuring wind velocity. *Subject Headings:* **1. Turbulence measurement 2. Pilot balloon data 3. Leipzig, Germany.**

3K–37 551.551:551.588.2

Morgans, W. R., **A memorandum giving a summary of present knowledge on the relation between ground contours, atmospheric turbulence, wind speed and direction.** *Great Britain. Aeronautical Research Committee. Technical Report for the year 1932*, 1:679–715, **1933;** *Reports and Memoranda*, No. 1456, Dec. 23, **1931.** tables, eqs. **DLC**—Knowledge to date of the effect of topography on the flow of wind is summarized. Paragraphs 3.22 and 4.20 include brief mention of the critical

velocity (approx. 10m/sec) below which flow is comparatively steady with some eddies and above which flow is turbulent. *Subject Heading:* **1. Orographic turbulence.**

1934

3K-38 551.551:551.507.352

Müller, Hans, **Beschleunigungsmessungen im Fluge zur Erforschung der atmosphärischen Luftunruhe.** [Acceleration measurements in flight to determine atmospheric turbulence.] *Beiträge zur Physik der freien Atmosphäre*, 21(4):283–308, **1934.** 20 figs., refs. **DLC**—The various types of atmospheric unrest are classified. It is suggested that the term "turbulence" be used to describe only those atmospheric motions occurring near the ground or on the border between two different air masses. *Subject Heading:* **1. Turbulence measurement.**

3K-39 551.551:551.515.8

Namias, Jerome, **Structure of a wedge of continental polar air determined from aerological observations.** *Massachusetts Institute of Technology, Meteorological Course, Prof. Notes*, No. 6, Cambridge, **1934.** 26 p. 22 figs., tables, bibliog. p. 26. **DWB**—Fig. 10 in NAMIAS' paper pictures an upper air sounding showing the regions where the aircraft making the soundings unexpectedly encountered bumpiness in clear air above the clouds. A second figure, No. 11, illustrates the tentative explanation suggested to the author by Dr. K. O. LANGE that bumpiness might be the result of changes in air speed experienced by the aircraft as it passed through some sort of gravity waves in the subsidence inversion existent at the time. *Subject Headings:* **1. Clear air turbulence 2. Gravity waves 3. Subsidence inversions.**—*C. P. Mook.*

3K-40 551.551:629.13

Thompson, F. L., Peck, W. C. and Beard, A. P., **Air conditions close to the ground and the effect on airplane landings.** *U. S. NACA, Report*, No. 489, **1934.** 15 p. 27 figs., 2 tables, 7 refs. **DLC**—Measurements of horizontal and vertical wind velocity variation up to about 50 ft above the ground led to the conclusion that unchecked glide landings in gusty air were unduly hazardous. *Subject Headings:* **1. Turbulence in the frictional layer 2. Aeronautical meteorology 3. Gustiness.**

1935

3K-41 551.551:629.13

Baldit, A., **Les perturbations dues au relief terrestre et l'aviation.** [Disturbances due to topography and flight.] Paris, Société Météorologique de France, **1935.** Also in: *La Météorologie*, No. 121, June **1935.** 46 p. 12 figs., tables, refs. **DWB**—Winds, gustiness, vertical currents, eddies and turbulence encountered over plains, forests, marshes, hills, mountains, valleys, oceans and transitional areas are discussed with regard to their effect on flight. *Subject Headings:* **1. Turbulence in the frictional layer 2. Orographic turbulence 3. Aeronautical meteorology.**

3K-42 551.551:551.507.321.2

Poncelet, Lucien, **Sur des mouvements de turbulence dans la stratosphère décelés par un ballon-sonde.** [On turbulence motion in the stratosphere observed by means of a sounding balloon.] *Académie Royale des Sciences . . . de Belgique, Bulletin de la Classe des Sciences*, 5th Ser., 21(2):195–215, **1935.** 6 figs., 2 tables, refs., eqs. **DWB**—By double theodolite observation of balloons launched at Uccle certain conclusions regarding the relation between stratospheric turbulence, vertical currents and pressure-temperature curves are drawn. *Subject Headings:* **1. Turbulence measurement 2. Double theodolite observation 3. Stratosphere.**

3K-43 551.551

Schmidt, Wilhelm, **Turbulence near the ground.** *Royal Aeronautical Society, Journal*, 39(293): 355–368, **1935.** Discussion and reply p. 368–376. 9 figs., 2 tables. **DLC**—Almost a million observations of wind speed at various points on a grid oriented across the prevailing wind (6 m high and 12 m wide) were made by means of a moving picture camera which gave instantaneous records of the angle the arm connected to a light pressure plate made with the vertical. The results of such small scale turbulence observations made over a frozen lake (Lunz Lake), over a grass covered airport (Aspern-Vienna), over a stubble field, a turnip field, etc. under varying conditions are included. Land breeze wind structure is compared with sea breeze structure. Effect of a small reed covered island, 160 m from frame, was marked compared with unobstructed readings. Correlation coefficients between horizontal and vertical spacings given in a table. No persistence of waves was found in a harmonic analysis of gust sequences. Coefficients of turbulence are also worked out. *Subject Headings:* **1. Turbulence in the frictional layer 2. Turbulence measurement.**—*M.R.*

3K–44 551.551:551.543.3

Stone, Robert G., **H. Helm Clayton's statistical study of wave like pressure oscillations observed at Blue Hill between 1885 and 1893.** *American Meteorological Society, Bulletin*, 16(4):158–159, **1935. MH-BH**—Author postulates the existence of waves in warm frontal surfaces [of the kind described later by MOOK (*see* 3K–200 below)] to explain clear air turbulence and points out that regular wave like patterns are sometimes evident in warm frontal precipitation patterns as revealed by radar. *Subject Headings:* **1. Frontal turbulence 2. Pressure oscillations 3. Blue Hill Observatory, Mass.**—*Conrad P. Mook.*

1936

3K–45 551.558.1

Andrews, R. T., **Strong vertical current.** *Meteorological Magazine*, London, 71(847):165–166, Aug. **1936.** table. **DLC**—Brief account of a pibal ascent at Abbotsinch in Sept. during which a vertical current of 13 ft/sec was observed at 12,000 ft. *Subject Headings:* **1. Clear air turbulence 2. Vertical currents 3. Abbotsinch, England.**

1937

3K–46 551.551:551.596.1

Dahl, H. and Devik, O., **Effect of turbulence on the propagation of sound.** *Nature*, London, 139:550–551, **1937.** fig., 2 refs. **DLC**—Results of study of attenuation of sound at sea surface suggest that study of attenuation of a sound spectrum in open air might furnish a method for studying turbulence of the air. (*Same item as* J–69, Oct. 1950, *MAB.*) *Subject Headings:* **1. Atmospheric turbulence 2. Acoustical phenomena 3. Acoustical propagation.**—*H.P.K.*

3K–47 551.551:629.13

Rhode, Richard V., **Gust loads on airplanes.** *Society of Automotive Engineers, Transactions*, 40(3):81–88, Mar. **1937.** 18 figs., 2 tables, 4 eqs. **DLC**—Cases of severe turbulence reported by pilots of a Lockheed "Orion" and an Eastern Airlines' DC-2 are incorporated into an investigation of gust gradients. It is thought that modification of the gust gradients will lead to the discovery of the correct gust load requirements for different types of planes. *Subject Headings:* **1. Atmospheric turbulence 2. Gust loads 3. Aircraft design.**

1938

3K–48 551.551:551.507.321.2

Junge, Christian, **Turbulenzmessungen in den höheren Atmosphärenschichten.** [Measurements of turbulence in the higher atmospheric layers.] *Annalen der Hydrographie und Maritimen Meteorologie*, 66:104–109, **1938.** 16 figs., table, 5 refs., equations. **DLC**—Theory and practice of determining turbulence in the upper troposphere and stratosphere from variations in the ascension rate of sounding balloons and by special apparatus for use in connection with high altitude airplane flights. It is shown that the stratosphere is not perfectly free from turbulence as was once believed. Seven ascents were made in 1936 and 1937 at Frankfurt a.M. Synoptic conditions during ascents described in connection with analysis of turbulence encountered. *Subject Headings:* **1. Turbulence measurement 2. Stratosphere 3. Frankfurt a.M., Germany.**—*M.R.*

3K–49 551.551:629.13

Mironovitch, V. and Viaut, André, **Turbulence et navigation aérienne dans la substratosphère.** [Turbulence and aerial navigation in the substratosphere.] *L'Aéronautique*, Paris, 20:202–206, Oct. **1938.** 5 figs., tables. **DLC**—Noted by sounding balloon observations that at the beginning of the stratosphere exists a very agitated layer of transition from the troposphere. Necessity of avoiding this region in flight planning emphasized. *Subject Headings:* **1. Clear air turbulence 2. Tropopause turbulence 3. Aeronautical meteorology.**—*H.P.K.*

3K–50 551.551

*Peppler, Wilhelm, **Die Böigkeit in der freien Atmosphäre nach den Beobachtungen in den Jahren 1931–1935.** [Gustiness in the free atmosphere according to observations of 1931–1935.] *Germany. Reichsamt für Wetterdienst, Wissenschaftliche Abhandlungen*, 5(6), **1938.** 28 p. 4 figs., 30 tables. **DLC**—A statistical analysis of gustiness based upon data obtained by weather flights at Munich, Darmstadt, Berlin, Hamburg and Königsberg during 1931–1935. The author discusses the frequency of lower and upper limits of strata in which gustiness occurs; frequency of calm, of various degrees of gustiness and of mean gustiness; relationship of strata of intense gustiness to barometric pressure and gradient wind, to weather situation and to cloudiness; and strata of intense gustiness in the free atmosphere. (*Same item as* 2.2–98, Feb. 1951, *MAB.*) *Subject Headings:* **1. Clear air turbulence 2. Gustiness 3. Germany.**—*I.L.D.*

1939

3K–51 551.551:551.576.11

Arenberg, David L., **Turbulence as the major factor in the growth of cloud drops.** *American Meteorological Society, Bulletin*, 20:444–448, Dec. **1939.** 3 figs., 5 refs., 16 eqs. **MH-BH**—Since other factors are insufficient to explain the growth of cloud drops, turbulence is discussed as possibly being the major factor in producing active precipitation. Visual observation establishes the fact that for small drops suspended in a cloud the flow pattern of the sustaining medium is the most important factor in governing their motion. *Subject Headings:* **1. Turbulence in clouds 2. Cloud physics.**—*H.P.K.*

3K–52 551.551.551.511(02)

†Lettau, Heinz, **Atmosphärische Turbulenz.** [Atmospheric turbulence.] Leipzig, Akademische Verlagsgesellschaft, **1939.** 283 p. 59 figs., 25 tables, 246 refs., numerous equations. (Lithoprinted by Edwards Brothers, Inc., Ann Arbor, Mich., **1944**). **DLC**—This classic text comprises the most thorough and systematic treatment of turbulence ever attempted. It includes chapters on turbulence in general; the history of research on hydrodynamics and (since 1904) on turbulence; kinetic theory of gas movement; austausch and turbulence near the earth's surface; austausch and turbulence in atmospheric boundary layers; friction and energy dissipation in atmospheric currents; measurement of parameters connected with turbulence; large scale (planetary) turbulence and finally 11 pages of bibliography. (*Same item as* 11–101, Nov. 1950, *MAB.*) *Subject Headings:* **1. Turbulence theory 2. Energy exchange 3. Fluid mechanics 4. Textbooks.**—*M.R.*

3K–53 551.551

*Peppler, Wilhelm, **Die Böigkeit morgens und nachmittags über Berlin.** [Gustiness in the morning and afternoon over Berlin.] *Zeitschrift für angewandte Meteorologie*, 56(12):383–395, Dec. **1939.** 3 figs., 8 tables, refs. **DWB**—An earlier airplane investigation of morning gustiness over Berlin (*see* 3K–50 above) is expanded for the purpose of comparing morning and afternoon gustiness. Seasonal variations and relation to the height of the cloud base are considered. *Subject Headings:* **1. Atmospheric turbulence 2. Gustiness 3. Urban climatology 4. Berlin, Germany.**

3K–54 551.576.11:551.43

Reinhardt, H., **Ein Beitrag zum Problem der hohen Hinderniswolken.** [A contribution to the problem of high obstacle clouds.] *Beiträge zur Physik der freien Atmosphäre*, 26(1):23–37, **1939.** 16 figs., 21 refs. **DLC**—Information about the high obstacle clouds and low turbulence clouds on the lee of the Riesen Gebirge in föhn weather is set out, with M.S.L. isobars and 500 mb isohypses, upper air ascents and anemograms. Two types of lee waves are distinguished, an upper system and also travelling whirls with horizontal axes in the turbulent zone. (*Same item as* K–224, Nov. 1950, *MAB.*) *Subject Headings:* **1. Orographic turbulence 2. Mountain meteorology 3. Cloud structure 4. Riesen Gebirge, Germany.**—*C.E.P.B.*

1941

3K–55 551.511:551.551

Haurwitz, Bernhard, **Dynamic meteorology.** New York, McGraw-Hill, **1941.** **DLC**—In Chap. X, "Atmospheric turbulence" (p. 188–215. 4 figs., refs., 9 eqs.), there is a lucid presentation of the basic theory of turbulence, starting with shearing stress in viscous fluids, the Reynolds stresses and number *Re*, turbulent motion, Prandtl's theory of momentum transfer, vertical wind profile, Taylor's theory of vorticity transfer, etc., and finally, taking up work by VON KÁRMÁN, ROSSBY, SUTTON, RICHARDSON and others, and the work of HESSELBERG, SVERDRUP, ÅKERBLOM and EKMAN on the effect of turbulence on the height of the gradient wind level. Chap. XI, "Turbulent mass exchange" (p. 216–237. 4 figs., refs., 5 eqs.), takes up the history, theory and applications of theory of turbulent mass exchange. *Subject Headings:* **1. Atmospheric turbulence 2. Dynamic meteorology 3. Textbooks 4. Turbulent exchange.**—*M.R.*

3K–56 551.5(02)

Pettersen, Sverre, **Introduction to meteorology.** New York, McGraw-Hill, **1941.** Chap. VI, **Temperature variations and their relation to the weather phenomena.** p. 68–97. 14 figs., table. **DLC**—In Chap. 6 there is a discussion of courses of heat, radiation, heat transfer and vertical mixing, horizontal mixing and effects of air movement over heated water or land, convection, thunderstorms, etc. In Chap. 7, on "Wind systems," a section on turbulence (p. 118–122) presents several models of air flow over flat and rough ground, and over mountain barriers or other obstacles, and some practical applications to aviation. Bumpiness in frontal zones is also considered. *Subject Headings:* **1. Orographic turbulence 2. Textbooks 3. Turbulence in the frictional layer.**—*M.R.*

3K–57 551.551:629.13

Pierce, Harold B., **Dynamic stress calculations for two airplanes in various gusts.** *U. S. NACA, Wartime Report*, No. L-484, Sept. **1941.** 13 p. 12 figs., 2 tables, 3 refs. **DLC**—A series of calculations made to determine the probable dynamic wind stress of two large airplanes in atmospheric gusts disclosed a possibility of serious overstress. *Subject Headings:* **1. Aircraft design 2. Gust loads.**

3K–58 551.551

Reichardt, Hans, **Über eine neue Theorie der freien Turbulenz.** [On a new theory of free turbulence.] *Zeitschrift für angewandte Mathematik und Mechanik*, Berlin, 21(5):257–264, Oct. **1941.** fig., refs., 15 equations. **DLC**—The author claims to have formulated a new phenomenological theory of free turbulent flow, based on the analogy between turbulent and molecular processes. The spectral distribution of turbulent impulses can be expressed by the statistical curve of probability of error. These integral approximations are combined with the equations of motion to produce an equation which represents the "impulse profile." *Subject Headings:* **1. Turbulence spectrum 2. Turbulence theory.**—*M.R.*

1942

3K–59 551.515.4:551.551:629.13

Browne, J. A., **Thunderstorm characteristics and flight procedures.** *Transcontinental and Western Air, Inc., Meteorological Dept., Technical Note*, No. 5, July 20, **1942.** Kansas City, Mo. 19 p. figs. **DWB**—On p. 3 under the heading "Potential hazards." turbulence is cited as the foremost thunderstorm danger. Flight procedures for encountering minimum turbulence are outlined. *Subject Headings:* **1. Thunderstorm turbulence 2. Aeronautical meteorology 3. Turbulence in the frictional layer.**

3K–60 551.551:551.524.4

Čadež, Marjan, **Vpliv turbulence na nastanek in razvoj inverzijter na razvoj ničstopinjskih izotermij.** [Influence of turbulence on the origin and development of inversions and the zero isotherm.] *Slovenska Akademije Znanosti im Umetnosti v Ljubljani, Razprave*, 21(2):481–501, **1942.** 3 figs., 29 refs., 19 eqs. Italian summary p. 496–500. **DWB**—The earlier theoretical work of Margules, Wegener, Koschmieder, Lettau, Findeisen, the author and others is reviewed in a systematic manner and applied to the mutual effect of turbulence in lapse rates, cloud formation, surface inversions and finally, the formation of the zero isotherm. The influence of snow falling through turbulent air prevents the formation of a well-defined zero isotherm such as would be found in stable air. (*Same item as* 2.5–108, May 1951, *MAB.*) *Subject Headings:* **1. Atmospheric turbulence 2. Inversions 3. Zero isotherm 4. Change of state.**—*M.R.*

3K–61 551.551:551.5(02)

Harrison, Louis P., **Wind, turbulence, and some of the forces determining air motion.** (In **Meteorology.** New York, National Aeronautics Council, **1942.** p. 239–249. 3 figs.) **DLC**—In the chapter cited, the turbulent structure of wind is shown by an example of a Dines anemograph record. Turbulence is classified into two types, thermal and mechanical and the causes of each described. Effects such as cumulus clouds, mountain-valley breezes, sea breezes, whirlwinds or dust devils, lee eddies, bumpiness and conditions at frontal surfaces are clearly described and illustrated with schematic diagrams. *Subject Headings:* **1. Turbulence in the frictional layer 2. Textbooks.**—*M.R.*

3K–62 551.551

Prandtl, Ludwig, **Bemerkungen zur Theorie der freien Turbulenz.** [Remarks on the theory of free turbulence.] *Zeitschrift für angewandte Mathematik und Mechanik*, Berlin, 22(5):241–243, **1942.** refs., 9 eqs. **DLC**—A review of the basic formulas of Reynolds, Boussinesq and the author (1925), and the part the latter plays in bridging the gap between the first two—the introduction of the concepts of mixing length (l) and the austausch coefficient of W. Schmidt used in meteorology, as well as the examples worked out by Reichardt and Görtler (1942), are simply explained. *Subject Headings:* **1. Free air turbulence. I. Reynolds, Osborne II. Boussinesq, J. III. Reichardt, Hans IV. Görtler, H.**—*M.R.*

3K–63 551.551:629.13

U. S., National Advisory Committee on Aeronautics, Flight Research Loads Section, **Operations in cumulo-nimbus and cumulus congestus cloud on July 3, 1941. Maximum gust intensities.** *U. S. NACA, Wartime Report*, No. L-555, **1942.** 5 p. fig., table, refs. **DLC**—Meteorological conditions and maximum gust conditions associated with a turbulence survey flight of an XC-35 airplane through a large cumulus congestus cloud near Langley Field, Va. are reported. Results of

this particular case study show moderate turbulence increasing with altitude till the top of the cloud was reached. *Subject Headings:* **1. Turbulence in clouds 2. Aeronautical meteorology 3. Gustiness 4. Langley Field, Va.**

3K–64 551.551:551.507.352

U. S. National Advisory Committee for Aeronautics, Flight Research Loads Section, Langley Memorial Aeronautical Laboratory, **Preliminary analysis of gust measurements.** *U. S. NACA, Restricted Bulletin,* April **1942**; *XC-35 Gust Research Project, Bulletin,* No. 6. figs., tables, refs. **DLC**—This report is the sixth in a series reporting "measurements of gust size and intensity made during the spring and summer of 1941 under a wide variety of weather conditions at altitudes up to 34,000 ft" using the Army XC-35 airplane. "Results indicate that the average gradient distance is independent of altitude and increases slightly as the gust velocity increases." Maximum effective gusts (approximately 32 ft sec) appeared to be independent of altitude. *Subject Headings:* **1. Clear air turbulence 2. Gustiness 3. Aeronautical meteorology.**

3K–65 551.551:551.507.352

*Walker, Walter G., **Summary of V-G records taken on transport airplanes from 1932 to 1942.** *U. S. NACA, Wartime Report,* No. L-453, July **1942.** 10 p. 5 figs., 3 tables, eqs. **DLC**—Analysis of the V-G recorder data compiled during more than 134,000 flight hours show maximum gust velocities (based on maximum wind loading) to approximate +40 ft/sec and indicate that composite gust velocity curves for land-planes and flying boats closely approach each other. *Subject Headings:* **1. Atmospheric turbulence 2. Air-borne gust recorders 3. Gust loads 4. Aircraft design.**

1943

3K–66 551.551

Durst, Charles Sumner, **Measurement of turbulence in the free atmosphere.** *Great Britain. Meteorological Research Committee, MRP,* No. 64, **1943.** 3 p. 5 figs., 2 eqs. **DWB**—The magnitude of the swings of the cans of radio wind-finding balloons were plotted alongside the expression for the Richardson criterion to show the "reality of the swing as a representation of the amount of eddying and of the truth that Richardson's criterion gave, in fact, a measure of the stability of the atmosphere." *Subject Heading:* **1. Turbulence measurement.**

3K–67 551.551:629.13

Moskovitz, A. I., **Preliminary analysis of the lateral distribution of gust velocity along the span of an airplane.** *U. S. NACA, Wartime Report,* No. L-551, March **1942.** 14 p. 8 figs., refs., eqs. **DLC**—Report on measurements of the lateral distribution of effective gust velocity along the span of the XC-35 airplane made during the spring and summer of 1941 under a wide variety of weather conditions at altitudes up to 34,000 ft. *Subject Headings:* **1. Clear air turbulence 2. Aircraft design 3. Gust loads.**

1944

3K–68 551.551:629.13

*Moskovitz, A. I., **Analysis of gust measurements.** *U. S. NACA, Wartime Report,* No. L-552, April **1944.** 10 p. 7 figs., 12 tables, 5 refs. **DLC**—Results of tests made during 1941 and **1942** with Army plane XC-35, up to heights of 34,000 ft, mostly in convective clouds. Charts show that gust frequency per mile of rough air decreases with altitude, but the average gust-gradient distance, and maximum effective gust velocity were independent of altitude. The average gust-gradient distance increased somewhat with gust intensity. *Subject Headings:* **1. Turbulence in clouds 2. Gustiness 3. Aeronautical meteorology.**—*M.R.*

3K–69 551.551:629.13

*Rhode, Richard V. and Donely, Philip, **Frequency of occurrence of atmospheric gusts and of related loads on airplane structures.** *U. S. NACA, Wartime Report,* No. L-121, Nov. **1944.** 31 p. 10 figs., 5 tables, 12 refs. **DLC**—A statistical analysis of results of 1748 hours of operation of domestic and military transport airplanes (1937–42) representing 9,000,000 mi of operation. Gust load frequency varies inversely according to airplane size. Flights were made at low and high levels, in and out of cumulus type clouds and over the United States and on round trip ocean flights from Alameda to Hong Kong and on one flight to Panama and back. Data on gust frequency given in tables and graphs for different types of planes and operating conditions. Results compared with German tests. *Subject Headings:* **1. Turbulence in clouds 2. Gust loads 3. Aeronautical meteorology.**

3K–70 551.551:629.13

Spar, Jerome, **Some effects of gustiness on airplanes.** Summary of a paper presented at a staff seminar, New York University, Dept. of Meteorology, [**1944?**] 8 p. figs., 2 refs., eqs. Mime-

ographed. **DWB**—Author reviews the gust research of the U. S. NACA and others for the consumption of meteorologists and proposes a turbulence survey. *Subject Headings:* **1. Atmospheric turbulence 2. Gust loads 3. Aeronautical meteorology.**—*C. P. Mook.*

1945

3K–71 551.5(04) 551.551:629.13

Haynes, Benarthur C., **Civil air patrol cadet meteorology lecture series.** U. S. Weather Bureau, [1945?] 59 p. **DWB**—In this series, emphasis is placed on hazards to flying, such as bumpiness, icing, thunderstorms, fog and clouds. In the third lecture the effect of rough air is treated in more detail and examples of severe turbulence in cumulus clouds and free air are listed. Instances of accelerations of 8 or 10 g are quoted and sharp edged gusts of 30 ft/sec reported. Eddies formed over rough ground are also discussed. *Subject Headings:* **1. Clear air turbulence 2. Thunderstorm turbulence 3. Aeronautical meteorology 4. Addresses.**—*M.R.*

3K–72 551.558.1

Moskovitz, A. I., **Characteristics of vertical drafts and associated vertical-gust velocities within convective-type clouds.** *U. S. NACA, Wartime Report,* No. L-554. Jan. **1945.** 9 p. 2 figs., table, 4 refs. **DLC**—The intensity and extent of up or down drafts and associated gusts in convective clouds was measured with an airplane at various altitudes up to 30,600 ft. Results shown in charts and table indicate that maximum true gust velocities are on the average equal to the velocities of the vertical drafts (correlation coefficient .95 from barograph records and .99 from motion picture records). The extent of single up or down drafts was from 3 to 42% of the cloud width. *Subject Headings:* **1. Turbulence in clouds 2. Gust velocities 3. Vertical currents.**—*M.R.*

3K–73 551.551

Moskovitz, A. I. and Peiser, A. M., **Statistical analysis of the characteristics of repeated gusts in turbulent air.** *U. S. NACA, Wartime Report,* No. L-39, Nov. **1945.** 14 p. 12 figs., tables, 5 refs. **DLC**—Tests made in convective clouds show that turbulent motions are seldom isolated, but are contiguous. Successive gusts are usually opposite in direction. When several gusts occur in succession, average extreme gust velocities of 30 ft/sec were encountered; 7800 gusts were encountered in these tests, of which 6800 were in the repeated gust class and 5200 in sets of 3 or more. The statistical analysis for single, 2-gusts and 3 or more gusts includes data on spacing as well as intensity. *Subject Headings:* **1. Turbulence in clouds 2. Gustiness.**—*M.R.*

3K–74 551.551:629.13

Putnam, Abbot A., **An analysis of life expectancy of airplane wings in normal cruising flight.** *U. S. NACA, Report,* No. 805, **1945.** 9 p. 9 figs., 11 refs. **DLC**—Data on frequency of atmospheric gusts are analyzed in connection with the speed of plane, wing-load, fatigue life of plane, etc. It was found that fatigue life and single-gust life are of equal importance in the actual life of the plane. *Subject Headings:* **1. Atmospheric turbulence 2. Gust loads 3. Aircraft design.**—*M.R.*

3K–75 551.574.7:551.524.7

Serbein, O. N., **Certain aspects of aircraft icing in the Alaskan-Aleutian area.** *American Meteorological Society, Bulletin,* 26:419–425, **1945.** fig., 2 tables. **DWB, MH-BH**—Based on data obtained during flights Oct. 1943 to Sept. 1944. Effect of temperature and turbulence considered. (*Same item as* I–103, Sept. 1950, *MAB.*) *Subject Headings:* **1. Atmospheric turbulence 2. Icing of aircraft 3. Upper air temperatures 4. Aleutian Islands.**—*H.P.K.*

3K–76 551.551:551.507.352

Tolefson, Harold B., **Airspeed fluctuations as a measure of atmospheric turbulence.** *U. S. NACA, Wartime Report,* No. L-72, July **1945.** 10+p. 6 figs., 6 refs. **DLC**—Flights of XC-35 airplanes through cumulus, cumulus-congestus and cumulonimbus clouds were made in order to determine the effect of gusts on control of plane and on instruments. Conclusion is that maximum rapid fluctuations that occur in indicated airspeed readings are proportional to the maximum effective gust velocities. Also data on gust velocities obtained from such fluctuations can be readily converted into true gust velocities. Scatter diagrams show good correlation of the above. *Subject Headings:* **1. Turbulence measurement 2. Gustiness 3. Aircraft design.**—*M.R.*

3K–77 551.551:551.508.769

†Warfield, Calvin N. and Kenimer, Robert L., **An infrared cloud indicator. I-Analysis of of infrared-radiation exchange with tables and chart for calibration of the cloud indicator.** *U. S. NACA, Wartime Report,* No. L-18, Nov. **1945.** 61+p. 15 figs., 7 tables, 21 refs., 31 eqs. **DLC**—An attempt was made to design an instrument to help pilots avoid turbulent regions during night flights, by indicating not only the presence of clouds but the degree of turbulence. No solution was

found for the latter problem, but an infrared cloud indicator was developed at Langley Field Laboratory. The principles involved are described. Effects of absorption, scattering, etc., on radiation balance are also taken up. Useful tables and nomograms included. *Subject Headings:* **1. Turbulence measurement 2. Infrared radiation cloud indicators.**—*M.R.*

3K–78 551.551:551.507.352

Vine, A. C., **Accelerometer for air turbulence measurements in aircraft.** Memorandum on file at the Woods Hole Oceanographic Institution, Aug. **1945.** Unchecked. *Subject Heading:* **1. Turbulence measurement.**

1946

3K–79 551.551:551.524.4

§Baughman, Emmett E., Jr., **Turbulence with a stable lapse rate.** *American Meteorological Society, Bulletin*, 27(8):459–462, Oct. **1946.** 3 figs. **MH-BH**—An example of severe turbulence encountered on a flight from Iceland to Newfoundland is analyzed synoptically and dynamically to try to explain the apparent anomalous condition of turbulence in stable air. Actually, the turbulence was encountered in a frontal surface at the top layers of a region of fairly steep lapse rate at 5000–6000 ft, and in the surface layers where cold air was flowing over warm water and irregular topography. Smooth air was found well up in the warm easterly current (10,000 ft) which was separated from the cold northerly flow by the warm front surface where there was maximum shear. *Subject Headings:* **1. Frontal turbulence 2. Clear air turbulence 3. Newfoundland.**—*M.R.*

3K–80 551.554

Budyko, M. I. and Liapin, M. S., **Usloviia obrazovaniia termicheskoĭ konvektsii v nizhnikh sloiakh atmosfery.** [The conditions of formation of thermal convection in the lower layers of the atmosphere.] *Meteorologiia i Gidrologiia*, 5:50–53, **1946.** 2 figs., bibliog. **DLC**—A brief article accompanied by scatter diagrams showing the dependence of wind velocity on variations of air temperature at heights of 20 and 150 cm with stable and unstable conditions differentiated, and the dependence of the height of the smoke layer on Richardson's number. *Subject Headings:* **1. Turbulence in the frictional layer 2. Turbulence theory 3. Micrometeorological turbulence.**—*M.R.*

3K–81 551.551:551.509.59

George, Joseph Johnson, **Forecasting turbulence.** *Eastern Air Lines, Inc., Technical Bulletin*, No. 46–1, Mar. 6, **1946.** 2 p. 2 figs. Mimeographed. **WB-AS**—Author suggests a method of forecasting turbulence associated with cold fronts wherein he proposes that the turbulence experienced by aircraft in the vicinity is a function of the difference in wind components normal to the front when estimated from pibal ascents in both the warm and cold air. Moderate or severe turbulence should always be forecast if a pre-frontal line squall was formed or seems probable. *Subject Headings:* **1. Frontal turbulence 2. Airways forecasting 3. Turbulence forecasting 4. Cold fronts.**—*Conrad P. Mook.*

3K–82 551.515.4:551.594.221:629.13

†Harrison, Louis P., **Lightning discharges to aircraft and associated meteorological conditions.** *U. S. NACA, Technical Note*, No. 1001, May **1946.** 149+p. 13 figs., tables, 33 refs., 7 append., bibliog. p. 148–149. **MH-BH**—This report was intended primarily to be a technical report for pilots or aeronautical engineers on lightning damage to aircraft in flight. However, the material presented comprises one of the most comprehensive and analytical summaries ever made of the theoretical and empirical aspects of lightning, turbulence, and thunderstorm frequency and distribution which would be of interest to the meteorologist or forecaster. Cloud and thunderstorm, precipitation, turbulence and convective conditions associated with cases of lightning strikes to aircraft are presented. Recommendations for avoiding or reducing harmful effect from sparks, discharges, turbulence or other severe meteorological conditions are presented. (*Same item as* 2.1–87, Jan. 1951, *MAB.*) *Subject Headings:* **1. Thunderstorm turbulence 2. Lightning 3. United States.**—*M.R.*

3K–83 551.551:629.13

IUdin, M. I., **Voprosy teorii turbulentnosti i struktury vetra s prilozheniem k zadache o kolebaniiakh samoleta.** [Questions of turbulence theory and structure of wind with application to the problem of airplane vibrations.] *U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby, Trudy Nauchnoissledovatil'skikh Uchrezhdeniĭ, Ser. I, Meteorologiia*, No. 35, **1946.** 100 p. fig., tables, 65 refs., eqs. **DLC**—The author analyzed the problems of general turbulence, wind structure in free atmosphere, airplane vibrations and the conditions for use of the additional characteristic presented by Reynolds. He concluded that in the investigation of the turbulent transfer of heat and water vapor the classic theory of diffusion is applicable to continuous processes. More rational method of turbulence determination in the free atmosphere would be the observation of airplane

vibrations. In conclusion some considerations on airplane construction and improvement of wind structure investigations are given. *Subject Headings:* **1. Atmospheric turbulence 2. Wind structure 3. Aircraft design.**—*N.T.Z.*

3K–84 551.551

Pinus, N. Z., **K voprosu ob eksperimental'nom issledovanii poryvistosti vozdushnykh potokov v svobodnoĭ atmosfere.** [On the question of experimental investigation of gusty air currents in the free atmosphere.] *Meteorologiia i Gidrologiia*, 4:14–21, **1946.** 5 figs., 4 tables, bibliog. **DWB**—Results of visual and instrumental observations on turbulence of air currents on an airplane, given in tabular form with ample notes made on individual flights. Flights were made at Moscow between March 1934 and April 1945, with aerometeorograph for determining lapse rates and accelerograph for determining vertical velocities. (*Same item as* 40–26 in *American Meteorological Society, Bulletin*, 28(10):477, Dec. 1947.) *Subject Headings:* **1. Turbulence measurement 2. Clear air turbulence 3. Moscow.**—*M.R.*

3K–85 551.510.42:551.551

Sutton, O. G., **Wind and turbulence.** *Weather*, 1:82, July **1946. MH-BH**—The close association between wind and turbulence shown in explaining the drift of smoke from its source. Smoke forecasting discussed. (*Same item as* A–169, Jan. 1950, *MAB.*) *Subject Headings:* **1. Turbulent diffusion 2. Atmospheric pollution.**—*H.P.K.*

3K–86 551.551:551.515.4:551.507.352

*Tolefson, Harold B., **Evaluation of gust and draft velocities from flights of P-61C airplanes within thunderstorms July 22, 1946 to July 23, 1946 at Orlando.** *U. S. NACA, Research Memoranda*, Nos. L6K16, L7A14, L7C07, L7C19, L7C20, L7C21, L7C28, L7C31, L7D01, L7J29; October 16, **1946** through April 1, **1947.** entirely tables, ref. **DNACA**—A series of reports, each consisting of tabulated data obtained from measurements of gust and draft velocities and extents within thunderstorms over Florida. In some reports data on ambient air temperature variations obtained through inspection of photo-observer records for the flights are included. All observations were made with NACA instruments installed in P-61C airplanes. These observations differ from those made in Ohio in 1947 (*see* 3K–89 below) in that they are presented for consecutive space intervals rather than time intervals. *Subject Headings:* **1. Thunderstorm turbulence 2. Gust data 3. Air-borne gust recorders 4. Florida.**

3K–87 551.551:551.507.352

Tolefson, Harold B. and Pratt, K. G., **An analysis of the indications of the University of Chicago airborne turbulence indicator in gusty air.** *U. S. NACA, Wartime Report*, No. L-723, Aug. **1946.** 9 p. 4 figs., table, 6 refs. **DLC**—The turbulence indicator developed by the University of Chicago proved to be too erratic for most cases; errors of 0.3 g occurring for accelerations up to 1.0 g, thus introducing errors of 100% in values of effective gust velocity. Tests were made in flights through cumulus and alto-cumulus clouds at Chanute Field, Illinois. *Subject Headings:* **1. Turbulence measurement 2. Turbulence in clouds 3. Gustiness 4. Air-borne gust recorders.**—*M.R.*

1947

3K–88 551.551:551.509.59

EAL meteorologists revise turbulence forecast method. *American Aviation*, Wash., D. C., 11(7):25, Sept. **1947.** table. **DLC**—A new numerical way of reporting degree of turbulence and a forecast method based on the difference in temperature between rising air in the thunderstorm and the surrounding air are described. *Subject Headings:* **1. Thunderstorm turbulence 2. Aeronautical meteorology 3. Turbulence forecasting.**

3K–89 551.551:551.515.4:551.507.352

*Funk, Jack, **Evaluation of gust and draft velocities from flights of P-61C airplanes within thunderstorms June 2, 1947 to June 7, 1947 at Clinton County Army Air Field, Ohio.** *U. S. NACA, Research Memoranda*, Nos. L7J31, L7K25, L7L08, L8A20, L8A27, L8A30, L8B04, L8B27, L8C04, L8C19, L8C31; Oct. 31, **1947** through Mar. 31, **1948.** entirely tables, ref. **DNACA**—A series of reports, each consisting of tabulated data obtained from measurements of gust and draft velocities and extents within thunderstorms over Ohio. All observations were made with NACA instruments installed in P-61C airplanes (with the exception of RM L8B27 in which AT-6 airplanes were used). These observations differ from those made at Orlando, Florida in 1946 (*see* 3K–86 above) in that they are presented for consecutive time intervals rather than space intervals. *Subject Headings:* **1. Thunderstorm turbulence 2. Gust data 3. Air-borne gust recorders 4. Ohio.**

3K–90 551.551:551.509.59:551.515.4

George, Joseph Johnson, **Forecasting of turbulence in thunderstorms.** *Eastern Air Lines, Inc., Meteorological Bulletin* No. 47-38B, July 2, **1947.** 3 p. fig., table. *Ibid.*, No. 47-38B Supplement, Aug. 29, **1947.** 2 p.; *Ibid.*, No. 47-53B, Aug. 15, **1947.** 1 p. table; *Ibid.*, No. 47-64B, Oct. 21, **1947.** 2 p. All are mimeographed. **WB-AS**—Using data from 10 series of traverses of thunderstorm clouds at levels varying from 2,000 to 34,000 ft, author plots temperature difference between rising and surrounding air against a parameter specifying atmospheric turbulence in ft/sec. As the correlation seems to be quite good, he suggests a system of forecasting thunderstorm turbulence above 10,000 ft based on the temperature difference mentioned above. The supplement to 47-38B was issued to standardize use of the system by forecasters. No. 47-53B consists of further instructions to pilots in use of the method. No 47-64B presents corrections for No. 47-38B supplement and outlines a procedure for forecasting a turbulence parameter for frontal zone thunderstorms. *Subject Headings.* **1. Thunderstorm turbulence 2. Airways forecasting 3. Turbulence forecasting.**

3K–91 551.551:629.13

§Helfand, B. B., **Meteorological conditions associated with flight measurements of atmospheric turbulence.** *U. S. NACA, Technical Note*, No. 1273, June **1947.** 13 p. 20 figs., table, 4 refs. **DLC**—Description of weather conditions during 10 flights made in 1941 and 1942 to determine the turbulence conditions in convective type clouds along the eastern seaboard of the United States during spring and summer. Apparatus and procedure described. Flights classified in five categories according to air mass or frontal conditions. For each of the 10 flights selected for discussion, a figure is given to show the surface synoptic conditions at noon on the date of flight, and another shows the radiosonde data for that day, with a cloud photograph, winds aloft and effective gust velocities measured in various portions of the cloud. Assumption that maximum effective gust velocity is related to actual gust velocity. *Subject Headings:* **1. Turbulence in clouds 2. Aeronautical meteorology.**—*M.R.*

3K–92 551.551:551.509.5:629.13(788)

Horning, Forrest E., **Flying weather over the Colorado Mountains.** Denver, Colorado, U. S. Weather Bureau [**1947?**] 8 p. Typescript. **DWB**—The areas of greatest turbulence encountered by pilots flying along airways in Colorado are outlined, and the orographic and upper air or synoptic conditions most favorable to light or severe turbulence specified. Hints for pilots or forecasters who wish to anticipate areas of turbulence are given. Two types: (1) convective cloud turbulence and (2) lee or down draft turbulence may be serious for light planes flying low over mountains. The former type can be expected when cumulus clouds are observed over the peaks, and the latter when pibals at Denver or Grand Junction, Colorado indicate winds >35 mph between 9 and 14 thousand ft. *Subject Headings:* **1. Orographic turbulence 2. Aeronautical meteorology 3. Turbulence forecasting 4. Colorado. I. U. S. Weather Bureau.**—*M.R.*

3K–93 551.551

Koo, Chen-chao, **The general laws of frequency distribution of wind in a gust.** *Meteorological Magazine*, Nanking, 19(1–4):58–62, Aug. **1947.** 8 refs., eqs. In Chinese, English summary p. 58. **MH-BH**—The function for distribution of wind velocities in gusts is calculated when the two horizontal components of turbulence are correlated. The correlation is found to decrease as the steady wind velocity increases. (*Same item as* 2.4–109, April 1951, *MAB.*) *Subject Headings:* **1. Atmospheric turbulence 2. Gustiness.**—*C.E.P.B.*

3K–94 551.558.1:797.5 551.576.1

Neubroch, H., **Convections and the soaring pilot. II.** *Sailplane and Glider*, London, 15(5):2, 3, May **1947. DWB, DLC**—Thunderclouds which may extend to 30,000 ft may be used by a glider pilot to obtain altitude. "Observations made during Roen contest in 1938 indicate that vertical currents may start a few hundred feet below the base of the cloud and rise smoothly through the center of the cloud until a area of violent turbulence is reached. Icing may occur between 15,000 and 25,000 ft. Low temperatures make it necessary to provide cockpit heating." *Subject Headings:* **1. Thunderstorm turbulence 2. Vertical currents 3. Gliding.**—*M.R.*

3K–95 551.551

Petterssen, Sverre and Swinbank, W. C., **On the application of the Richardson criterion to large-scale turbulence in the free atmosphere.** *Royal Meteorological Society, Quarterly Journal*, 73(317–318):335–345, July–Oct. **1947.** 13 figs., 3 tables. **DWB.** Also in: *U. S. Office of Naval Operations. Aerology Section, NAVAER* 50-IT-31, **1945. DWB**—L. F. Richardson (*see* 3K-13 above) assumed that the coefficient of eddy diffusivity of momentum equals the eddy conductivity of heat. This was tested using 1556 simultaneous radiosonde observations of lapse rate and wind shear. The results (temperature lapse with pressure against vector wind shear) are plotted in 12

diagrams by 50 mb intervals from 900–300 mb, which also contain the limiting curve between increase and decrease of turbulence by Richardson's criterion. They show that the eddy transfer of heat is only about 0.65 of the eddy transfer of momentum. Condensation does not seem to effect average conditions. The variation of shear with time was studied on 44 occasions but the intervals (6–8 hours) were too long. *Subject Headings:* **1. Turbulence theory 2. Richardson criterion 3. Clear air turbulence.**—*C.E.P.B.*

3K–96 551.551

*Press, Harry, **The effect of sample size on the determination of maximum gust velocities in clouds.** *U. S. NACA, Research Memorandum,* No. L7H27, Oct. **1947.** 10 p. fig., 3 tables, 3 refs. **DLC**—Results of 38 flights with P-61 planes by the thunderstorm project at Orlando, Florida, and of flights of XC-35 at Langley Field, are analyzed statistically to determine effect of the record-distance of flight in clouds, on maximum gust velocities recorded. It was found that the latter is a function of the distance flown in clouds, and tables and graphs are presented to show relationships. It is suggested that data from 20 or more traverses of clouds are accurate for all practical purposes. *Subject Headings:* **1. Turbulence in clouds 2. Gustiness 3. Sampling techniques.**—*M.R.*

3K–97 551.507.321.2:551.551

Tateno, Japan. Aerological Observatory, **Observations of turbulence. The lower section.** *Tateno, Japan. Aerological Observatory, Journal,* 4(1):25–27, Dec. **1947.** In Japanese. English abstract p. 25. fig., table, eqs. **DLC**—We observed two pilot balloons which were freed adjacently at the same time and with the same ascending velocities, and calculated the turbulence of the air from the differences of the motions of the two balloons. *Subject Headings:* **1. Turbulence measurement 2. Pilot balloon observations.**—*Author's abstract.*

3K–98 551.551:551.515.4:551.507.352

*Tolefson, Harold B., **Evaluation of gust and draft velocities from flights of P-61C airplanes within thunderstorms May 13, 1947 to May 29, 1947 at Clinton County, Army Air Field, Ohio.** *U. S. NACA, Research Memorandum,* No. L7J29, Oct. 29, **1947.** 27 p. 2 tables. entirely data. **DNACA**—The first of a series of such reports containing data on gust and draft velocities and extents over Ohio. The subsequent data for the same location were prepared by JACK FUNK (*see* 3K–89 above). *Subject Headings:* **1. Thunderstorm turbulence 2. Gustiness 3. Ohio.**

3K–99 551.515.4:551.511

Tolefson, Harold B., **Preliminary analysis of NACA measurements of atmospheric turbulence within a thunderstorm—U. S. Weather Bureau Thunderstorm Project.** *U. S. NACA, Technical Note,* No. 1233, March **1947.** 8 p. 3 figs., 2 tables, 3 refs., eq. **DLC**—Report of Thunderstorm Project field operations around Orlando, Florida. Summary of acceleration and gust velocity measurements within a thunderstorm given, along with time histories of acceleration for traverses through a thundercloud and time variations of atmospheric turbulence measured within thunderclouds. (*Same item as* II-171, Aug. 1950, *MAB.*) *Subject Headings:* **1. Thunderstorm turbulence 2. Vertical currents.**—*H.P.K.*

3K–100 551.551:629.13

Tye, W., **Gusts.** *Royal Aeronautical Society, Journal,* 51(441):721–732, Sept. **1947.** 5 figs., table. **DLC**—The extent of present knowledge of gusts is summarized, the gaps in information pointed out, and a logical framework for future gust requirements in airplane design suggested. *Subject Headings:* **1. Atmospheric turbulence 2. Gustiness 3. Aircraft design.**

3K–101 551.551

Yamamoto, Gi-ichi and Shiotani, Masao, **Turbulence in the free atmosphere. I.** *Metcorological Society of Japan, Journal, 2nd Ser.,* 25:120–132, Oct.–Dec. **1947. Part II,** *Ibid.,* 26:149–157, June **1948. DWB.** Also in: *Geophysical Magazine,* Tokyo, 20:21–30, **1948** and 20:105–111, **1949.** 4 figs., 5 tables, 2 refs., eqs. **DWB**—Pt. I. Investigation of atmospheric turbulence at about 38–50 m above ground, where vertical gradient of wind velocity is almost negligible and turbulence may be accepted as quasi-isotropic. Intensity and scale of free atmospheric turbulence derived following TAYLOR's line of research. Pt. II. Relation between these quantities and length of time interval analyzed in some detail from observed data described in 1st report. *Subject Heading:* **1. Turbulence in the frictional layer.**—*H. P. K.*

1948

3K–102 551.551:551.515.8

Aanensen, C. J. M., **Turbulence in clear air near a warm-front surface.** *Meteorological Magazine,* London, 77(915):209–210, **1948. DWB**—An account of an unusual occurrence of turbulence

at the 500 mb level (18,000 ft) giving exact location with respect to warm front. *Subject Heading:* **1. Clear air turbulence.**

3K–103 551.551

*Bannon, J. K., **Meteorological factors in the occurrence of turbulence at high altitudes: interim report.** *Great Britain. Meteorological Research Committee, M.R.P.*, No. 436, Oct. 1, **1948.** 12 p. 6 figs., 3 fold. tables, 7 refs., 9 tables, eqs. **DWB**—Tabulated data from BEA and from the British High Altitude Gust Investigation are studied and analyzed. The frequent occurrence of bumpiness near the tropopause is mentioned and the relation of high altitude turbulence to strong wind shear in the horizontal stressed. Regions of such strong horizontal shear above 20,000 ft are indicated on a weather map. *Subject Headings:* **1. Clear air turbulence 2. Horizontal wind shear 3. Tropopause turbulence.**

3K–104 551.574.1:551.551

Blanchard, D. C., **Observations on the behavior of water drops at terminal velocity in air.** *General Electric Research Laboratory, Project Cirrus, Occasional Report*, No. 7, **1948.** 8 figs., 5 refs., 6 eqs. **MH-BH**—Information concerning breakup of drops in nonturbulent and turbulent air streams. (Basic to water seeding.) (*Same item as* C-67, March 1950, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Atmospheric turbulence.**—*H.P.K.*

3K–105 551.551:629.13

Briegleb, William C., **Wind shifts and stalls.** *Aviation Week*, New York, 48(17):33, May 3, **1948.** **DLC**—A letter to the editor telling of the author's experiences with wind shifts and gusts at low altitudes, particularly those associated with thermals. *Subject Headings:* **1. Turbulence in the frictional layer 2. Aeronautical meteorology 3. Gustiness 4. Thermals.**

3K–106 551.515.4

*†Byers, Horace R. and Braham, Roscoe R., Jr., **Thunderstorm structure and circulation.** *Journal of Meteorology*, 5(3):71–86, June **1948.** 23 figs., 16 refs. **DWB**—Data from Thunderstorm Project observations in Florida, derived mainly from airplane traverses through thunderstorms, are analyzed to obtain a description of thunderstorm structure and circulation. The independent convective cells of which thunderstorms consist are comprehensively discussed. It is found that there is a break or cessation of turbulence between the cells. Thermodynamics of circulation are considered at length. (*Same item as* H–176, Aug. 1950, *MAB.*) *Subject Headings:* **1. Thunderstorm turbulence 2. Thunderstorm dynamics.**—*H.P.K.*

3K–107 551.557:551.551

Durst, C. S., **The fine structure of wind in free air.** *Royal Meteorological Society, Quarterly Journal*, 74(321–322):349–360, July–Oct. **1948.** 6 figs., 3 tables. **DWB**—Tabular and graphical results of 21 sets of photographic observations on single and dual smoke puffs ejected at heights of from 5,000 to 20,000 ft in clear air (between Sept. 1946 and Oct. 1947) to determine small variations of wind with height, distance, time and wind speed. Fluctuations at high levels are comparable in periodicity to surface wind fluctuations and those at low levels are correlated with those higher up, but no connection has appeared between wind speed, stability, or type of air and the magnitude of variations. Conditions on cloudy days would probably prove much different from these results obtained during clear weather. (*Same item as* No. 2–132, Feb. 1950, *MAB.*) *Subject Headings:* **1. Upper air winds 2. Clear air turbulence.**—*C.E.P.B.*

3K–108 551.551:551.511

†Frost, R., **Atmospheric turbulence.** *Royal Meteorological Society, Quarterly Journal*, 74(321–322):316–338, July–Oct. **1948.** 7 figs., 18 tables, 22 refs., 53 eqs. **DWB**—Modification of classical theory of turbulence to show that K is not constant with height but is represented by a power law, the use of which helps explain observed lapse rates and variations of wind with height and other problems of atmospheric diffusion and stability. Elaborate tables and graphs are given to show the variations of the many parameters with height, stability, roughness, time of day, etc., over sea and land. Practical rules are deduced from theory checked against observations. (*Same item as* 2–122, Feb. 1950, *MAB.*) *Subject Headings:* **1. Atmospheric turbulence 2. Turbulence theory.**—*C.E.P.B.*

3K–109 551.558.1:797.5

Georgii, Walter, **Les bases météorologiques du vol à voile.** [Meteorological bases of gliding.] Paris, Service de Documentation et d'Information Technique de l'Aéronautique, **1948.** 78 p. 99 figs. (Trans. by Edward L. Corton, Jr. at U. S. Naval Ordnance Test Station, Inyokern, TM-258, Aug. 1952.) **DWB**—An excellent monograph on the hydrodynamic and meteorological factors affecting soaring including orographic effects, thermals, inversions, vertical currents, standing waves

and clear air turbulence. *Subject Headings:* **1. Clear air turbulence 2. Gliding 3. Vertical currents 4. Orographic turbulence. I. France. Service de Documentation et d'Information Technique de l'Aéronautique II. Corton, Edward L., Jr.** (*trans.*).—*M.R.*

3K–110 551.551:551.509.59

Gringorten, Irving I. and Press, Harry, **A meteorological measure of maximum gust velocities in clouds.** *U. S. NACA, Technical Note,* No. 1569, April **1948.** 20 p. 3 figs., 3 tables, 13 refs., 7 eqs. **DLC**—Relations between meteorological parameters (height of convective activity and horizontal variations in temperature) and maximum gust velocities observed in convective clouds, were investigated to determine their usefulness in forecasting intensity of turbulence in clouds. A correlation coefficient of 0.7 is higher than any previously obtained for meteorological parameters vs. turbulence. Study was based on 29 flights of an XC-35 airplane at Langley Field, Va. During each flight from 1 to 20 traverses were made in cumulus clouds at heights from 1,000 to 34,000 ft (a few stratocumulus, altocumulus or cirrus clouds were traversed). Meteorological data were obtained from daily radiosonde flights. Diagrams and tables show data and give a basis for simple forecast procedure. *Subject Headings:* **1. Turbulence forecasting 2. Gustiness 3. Turbulence in clouds 4. Langley Field, Va.**—*M.R.*

3K–111 551.554 551.551

Horning, Forrest E., **Turbulence over the Colorado mountains.** Denver, Colorado, Division of Aeronautics, **1948.** 5 p. figs., tables. **DWB**—The conditions of upper air winds, stability of the air and rate of advection of cold air aloft associated with turbulence over the Rocky Mountains in western Colorado are discussed. Seven cases of turbulence reported by pilots are tabulated. *Subject Headings:* **1. Orographic turbulence 2. Aeronautical meteorology 3. Rocky Mountains, Colo.**

3K–112 551.551:551.574.42

Howell, Wallace Egbert, **Preliminary report on the relation of icing to turbulence at Mount Washington.** *U. S. Air Force. Air Materiel Command, Technical Report,* No. 5676, **1948,** p. 88–113. 5 figs., 2 tables, 7 refs. Also in: Harvard–Mount Washington Icing Research Report, **1946–47. DLC**—A detailed study of the relation between static pressure, total pressure and wind speed during different weather situations with relation to icing occurrence. Barograph and anemograph records made on Mt. Washington are reproduced, showing extreme turbulence and other features observed at times of icing. *Subject Headings:* **1. Atmospheric turbulence 2. Icing 3. Mt. Washington, N. H.**—*M.R.*

3K–113 551.551

Langwell, Patricia A., **Inhomogeneities of turbulence, temperature and moisture in the West Indies trade wind region.** *Journal of Meteorology,* 5(5):243–246, Oct. **1948.** 3 figs., table, 2 refs., eqs. **MH-BH**—Report of an airplane investigation of convection cells in clear air between Cu-clouds over the ocean near Puerto Rico in April 1946. Clear air turbulence was explained in this case as the remains of dissipated cloud. *Subject Headings:* **1. Clear air turbulence 2. Convective cells 3. Puerto Rico.**

3K–114 551.551

Loeser, G., **Vergleich der Möglichkeiten zur Messung der Turbulenz in der freien Atmosphäre.** [Comparison of the possible means of measuring turbulence in the free atmosphere.] *Zeitschrift für Meteorologie,* 2(9):275–279, Sept. **1948.** table, refs. **DWB**—Twenty-five methods very briefly described and compared with each other in tabular form. Chief advocates of the various methods are mentioned in numerous cases and reference made to their work. *Subject Headings:* **1. Clear air turbulence 2. Turbulence measurement.**

3K–115 551.551:551.507.352

Press, Harry, **A statistical analysis of gust-velocity measurements as affected by pilots and airplanes.** *U. S. NACA, Technical Note,* No. 1645, June **1948.** 12 p. 2 figs., 3 tables, 4 refs. **DLC**—Possible errors of ±10% were found in gust measurements made by 12 pilots using 10 airplanes and flying 485 traverses through convective clouds in Florida. The extreme errors were made by 3 of the pilots and 2 of the airplanes, and the statistical tests applied paint a dark picture for those men. However, granting the existence of a few isolated extreme velocities, or of the greater or lesser courage of some of the pilots in avoiding or encountering extreme conditions, the tests do not appear too conclusive. *Subject Headings:* **1. Turbulence in clouds 2. Gustiness 3. Florida.**—*M.R.*

3K–116 551.501.81:551.551:629.135

Press, Harry and Binckley, E. T., **A preliminary evaluation of the use of ground radar for the avoidance of turbulent clouds.** *U. S. NACA, Technical Note,* No. 1684, **1948.** 13 p. 4 figs.,

2 tables, 4 refs. **DLC**—Data obtained from 16 flights through convective clouds in Florida, during the 1946 Thunderstorm Project operations, indicate that turbulence can be avoided or minimized by avoiding regions of radar echo as observed on the ground. In vicinity of radar echoes an effective gust velocity of 30 ft/sec will be exceeded once in 120 miles of flight, but only once in 1200 mi of flight if at least 2 mi from a radar echo. (*Same item as* 2H–116, Aug. 1951, *MAB.*) *Subject Headings:* **1. Turbulence in clouds 2. Gustiness 3. Radar storm detection 4. Florida.**

3K–117 551.501.8:551.515.4:629.13

A report on thunderstorm conditions affecting flight operations. *U. S. Weather Bureau, Technical Paper,* No. 7, April **1948.** 52 p. 12 figs., 20 tables, 15 refs. **DWB**—As part of a preliminary analysis of data gathered by the Thunderstorm Project, the interrelation of turbulence and precipitation in thunderstorms is discussed and tabulated. Results of turbulence forecasts based on atmospheric soundings using thermodynamic and turbulence parameters (the latter computed from observed gust velocity and distribution) are analyzed. (*Same item as* 2H–118, Aug. 1951, *MAB.*) *Subject Headings:* **1. Thunderstorm turbulence 2. Aeronautical meteorology 3. Thunderstorm dynamics.**

3K–118 551.576.1/4 551.551

*Rossi, Veikko, **Untersuchungen über die Wolken nach meteorologischen und aerologischen Beobachtungen in Utti 1932-1939.** [Investigations of clouds by means of meteorological and aerological observations in Utti, 1932–1939.] *Finland. Ilmatietellisen Keskuslaitoksen, Toimituksia,* No. 32, **1948.** 46 p. 32 tables, 21 refs. **MH-BH**—A statistical study of cloud amount, frequency and height at the aerological station of Utti, Finland, based on detailed observations made during the period 1932-1939, by eye, by airplane ascent and by pilot balloon (theodolite). Observations of turbulence and cloud type frequency made during airplane and radiosonde ascents are summarized. Seasonal frequencies at various heights, average depth of the turbulent layer (surface and aloft), frequency of cloud and turbulence by air mass type and physics of turbulence, cloud and rain formation are discussed. The text is supported by a wealth of analytical and integrated data. (*Same item as* 10–125, Oct. 1950, *MAB.*) *Subject Headings:* **1. Turbulence in clouds 2. Cloud height 3. Cloud structure 4. Utti, Finland.**—*M.R.*

3K–119 551.551

Squire, H. B., **Reconsideration of the theory of free turbulence.** *Philosophical Magazine,* London, 39(288):1–20, Jan. **1948.** 7 figs., 7 refs., eqs. **DLC**—Recent experiments show that the turbulent exchange of heat takes place at a faster rate than the transfer of momentum. This seemingly supports the vorticity transfer theory of G. I. TAYLOR, although no adequate check has been made. Various theories of turbulent flow (momentum transfer, vorticity transfer, similarity theory of VON KÁRMÁN, REICHARDT's theory and the constant shear coefficient assumption) are reviewed. It is concluded that the fluctuating pressure gradients cannot be ignored as they are in the momentum transfer theory. *Subject Heading:* **1. Turbulence theory.**—*M.R.*

3K–120 551.551:551.501.8

Steiner, Roy, **An evaluation of air-borne radar as a means of avoiding atmospheric turbulence.** *U. S. NACA, Research Memorandum,* No. L8101, Nov. 22, **1948.** 9 p. fig., 3 tables, 3 refs., formula. Mimeographed. **DWB**—Gust-velocity measurements and air-borne radar observations obtained during a transcontinental flight in July 1947 have been analyzed as part of a general investigation of the uses of air-borne radar. The analysis indicates that some reduction in turbulence and a consequent reduction in the risk of encountering the larger gust velocities may be obtained by avoiding portion of clouds giving a radar echo. (*Same item as* 2H–122, Aug. 1951, *MAB.*) *Subject Headings:* **1. Turbulence in clouds 2. Air-borne radar 3. Radar storm detection 4. Aeronautical meteorology.**—*Author's abstract.*

3K–121 551.576.11:551.551

Tolefson, Harold B., **An analysis of the variation with altitude of effective gust velocity in convective-type clouds.** *U. S. NACA, Technical Note,* No. 1628, June **1948.** 15 p. 5 figs., 3 tables, 7 refs. **DLC**—An analysis of gust velocity data indicated that no appreciable velocity variations with altitude occur in the gust experience per mile flown within convective-type clouds up to 34,000 ft. It is probable that this is also true in even higher convective clouds the upper limits of which are still within the troposphere. *Subject Headings:* **1. Turbulence in clouds 2. Gustiness.**

3K–122 551.551:629.13

Treloar, H. M., **Note on abnormal vertical currents measured at Melbourne in relation to provision in aeroplane design against gust effects.** *Weather Development and Research Bulletin,* Melbourne, No. 11:37–40, Dec. **1948.** tables. **DWB**—Records of abnormal vertical currents

obtained through observations of pilot balloons at Melbourne are compared with standard gust intensities anticipated in air worthiness tests of aircraft. A case of a violent 31 m/sec updraft at a Cu-cloud base is reported. *Subject Headings:* **1. Turbulence in clouds 2. Gust loads 3. Aircraft design 4. Melbourne, Australia.**

3K–123 551.509.59:551.551:551.515.8:629.13

§*Whiting, R. M., **A method of forecasting the degree of turbulence in fronts and line squalls.** Eastern Air Lines, Inc., Meteorological Dept., Atlanta, Ga., **1948.** 22 p. 11 figs., tables, 6 refs., 4 eqs. **DWB**—A catalog of some 300 reports of turbulence encountered in flights over the eastern part of the United States during 1947 and 1948, divided according to cases 9000 ft or below and cases above 9,000 ft, is appended to an analysis and evaluation of the reporting and forecasting of turbulence degree (light, moderate and severe) or occurrence. Several bases are suggested, including the use of lapse rates. Two types of synoptic situations are recognized as important: cold front and line squall. The impact factor was found to be the best forecast tool, giving verification of 76% below and 84% above 9000 ft. (*Same item as* 3E–244, May 1952, *MAB.*) *Subject Headings:* **1. Turbulence forecasting 2. Objective forecasting 3. Frontal turbulence.**

1949

3K–124 551.551:551.501.8:551.515.4

American Airlines System, **The development of an airborne radar method of avoiding severe turbulence and heavy precipitation in the precipitation areas of thunderstorms and line squalls.** Contract No_a (S)-9006, Task No. 1, Final Report, Sept. 15, **1949.** 35 p. 15 figs., refs. Summary p. 1–2. **DWB**—Data from 40 probings of thunderstorm clouds and 600 miles of flight indicated that areas of maximum rainfall gradient contain the most frequent and probably the heaviest gusts. (*Same item as* D–240, April 1950, *MAB.*) *Subject Headings:* **1. Thunderstorm turbulence 2. Airborne radar 3. Radar storm detection. I. Contract No_a (S)-9006.**

3K–125 551.551

Bannon, J. K., **A note on a more general criterion of turbulence (after Richardson) and its application to the atmosphere.** *Great Britain. Meteorological Research Committee, M.R.P.*, No. 437, Jan. 25, **1949.** Rev. 4 p. 6 refs., eqs. **DWB**—An attempt is made to extend Richardson's criterion to include horizontal as well as vertical wind shear. An equation (No. 4) is derived to represent a measure of the reluctance of the atmosphere to become more turbulent. Application of the revised Richardson criterion to the atmosphere indicates very probable occurrence of turbulence just above the tropopause in good but not conclusive agreement with observations. Values derived for the coefficient of eddy diffusivity of momentum in the horizontal are in fair agreement with independent calculation of ROSSBY, GRIMMINGER and PRIESTLEY. *Subject Headings:* **1. Clear air turbulence 2. Richardson criterion 3. Horizontal wind shear.**

3K–126 551.551

Bannon, J. K., Jones, R. F. and others, **Turbulence in clear air and in cloud.** *Meteorological Magazine*, London, 78(922):112–118, April **1949.** fig. **DWB**—An account of the Meteorological Office symposium of Jan. 31, 1949. Chief contributors were J. K. BANNON who spoke on the "meteorological conditions associated with the occurrence of aircraft bumps at heights greater than 20,000 ft" and R. F. JONES who discussed turbulence in clouds. *Subject Headings:* **1. Clear air turbulence 2. Turbulence in clouds.**

3K–127 551.558.1:551.551:656.7

Briegleb, William C., **The wind and you.** *Flying*, New York, 44(5):30–32, 52, May **1949.** figs. **DWB**—Experiences of a pilot in flying in arid and mountainous regions. States that thermals sometimes extend up to 20,000 ft, and base of cumulus clouds over thermals at 23,000 ft above sea level. Dust carried to over 15,000 ft. Some dust thermals carry violent down drafts. Diagrams indicate nature and origin of thermals. (*Same item as* 2–135, Feb. 1950, *MAB.*) *Subject Headings:* **1. Orographic turbulence 2. Thermals 3. Aeronautical meteorology.**—*M.R.*

3K–128 551.515.4

Byers, Horace R., **Structure and dynamics of the thunderstorm. Part II.** *Weather*, 4(8):244–250, Aug. **1949.** 6 figs., 2 plates. **DWB**—A brief, well illustrated article dealing with cell development in thunderstorms. The findings of Air Force pilots in 1,363 flights through thunderstorms showed the most severe turbulence, updrafts, and downdrafts to exist at the altitudes most commonly flown by modern planes. Great confidence, however, was placed in the use of radar for avoiding such turbulence. *Subject Headings:* **1. Thunderstorm turbulence 2. Thunderstorm dynamics.**

3K–129 551.515.4:551.501.81:629.13

*†§Byers, Horace R. and Braham, Roscoe R., Jr., **The thunderstorm; report of the Thunderstorm Project.** (A joint project of four U. S. Government Agencies: Air Force, Navy, National Advisory Committee for Aeronautics, and Weather Bureau.) Washington, D. C., U. S. Govt. Print. Off., June 1949. 287 p. 254 figs., 49 tables, 63 refs., append. **MH-BH**—The final and most comprehensive of the Thunderstorm Project reports, containing Pt. I on thunderstorm structure and circulation (including a discussion of turbulence and hydrometeors), Pt. II on the effects of thunderstorms on flight and Pt. III, consisting of a series of case studies. (*Same item as* H–208, Aug. 1950, *MAB.*) *Subject Headings:* **1. Thunderstorm turbulence 2. Thunderstorms 3. Aeronautical meteorology.**—*H.P.K.*

3K–130 551.551:629.13

†Donely, Philip, **Summary of information relating to gust loads on airplanes.** *U. S. NACA, Technical Note,* 1976, Nov. **1949.** 145 p. 51 figs., 21 tables, 44 refs., eqs., appends. **DLC**—Available information on gust structure, airplane reactions, and pertinent operating statistics has been examined. This paper attempts to coordinate this information with reference to the prediction of gust loads on airplanes. The material covered represents research up to Oct. 1947. *Subject Headings:* **1. Atmospheric turbulence 2. Gust loads 3. Aircraft design.**—*NACA abstract.*

3K–131 551.558:629.13

Eyraud, R., **Influence des courants verticaux sur les avions.** [Influence of vertical currents on aircraft.] *Journal Scientifique de la Météorologie,* 1(1):23–31, Jan./March **1949.** 8 figs., 36 eqs. French, English and Spanish summaries p. 23. **MH-BH**—Theory and application of the theory of turbulence as it concerns vertical motions in the free atmosphere, to the stabilizing of aircraft in flight, with particular reference to improving observations made from airplanes which are used in studying turbulence. (*Same item as* 2–136, Feb 1950, *MAB.*) *Subject Headings:* **1. Atmospheric turbulence 2. Aeronautical meteorology 3. Vertical currents.**—*M.R.*

3K–132 551.551:551.509.59

George, Joseph Johnson, **A critical review of the present status of turbulence forecasting.** *Eastern Air Lines, Inc., Meteorological Bulletin,* No. 49-32B, Aug. **2, 1949.** 8 p. 4 figs., 4 refs., table. **WB-AS**—It is concluded that turbulence observations from the Thunderstorm Project are very valuable but may not represent the possible extremes. A quick appraisal is made of Whiting's (*see* 3K–123 above) turbulence forecast method and of the author's system with which E.A.L. has been obtaining excellent results. *Subject Headings:* **1. Turbulence forecasting 2. Airways forecasting.**

3K–133 551.551:629.13

Hislop, G. S., **Clear air turbulence incident encountered by D-H "Comet" aircraft 14th November, 1949.** *British European Airways Corp., R.S.D. Note,* No. 41, Dec. **1949.** 4 p. fig. **DWB**—A brief summary of aeronautical and synoptic conditions accompanying a case of severe turbulence in clear air at 34,000 to 38,000 ft elevation above England and Scotland. A warm front was moving in from the west (Ireland) but no turbulence was found above the cloud banks or to the east at 38–42,000 ft over Holland. It was thought that this and a few other cases of clear air turbulence were connected with the jet stream. Vertical gust velocities of +48 and −62 ft/sec (+2.0g and −2.6g) were encountered. *Subject Headings:* **1. Clear air turbulence 2. Jet stream turbulence 3. Great Britain.**—*M.R.*

3K–134 551.551:551.501.6

Johannessen, Thor Werner, **Some computations of the atmospheric turbulence.** *Meteorologiske Annaler,* 3(2):14–58, **1949.** 5 figs., 11 tables, 8 refs., 61 eqs. **DWB**—A quantitative study of the physical structure and magnitude of turbulence eddies in air streams. The detailed formulas, graphs and computation tables are presented and discussed for eddy stressed and eddy convectivity, smoothed over a long period. Calculations may thus be made from hodographs representing the lapse rate or shear in wind and temperature. Vertical and semi-lateral eddy convectivity due to large scale and to frictional turbulence are treated individually. Little is known about the large scale eddies. (*Same item as* 10–105, Oct. 1940, *MAB.*) *Subject Headings:* **1. Turbulence measurement 2. Eddy conductivity 3. Nomograms.**—*M.R.*

3K–135 551.551:551.501.8

*Jones, R. F., **Relation between radar echoes from cumulus and cumulonimbus clouds and the turbulence within these clouds. A report on the first year's operation of the cumulonimbus trials at the Meteorological Office radar station at East Hill in co-operation with aircraft from the Royal Aircraft Establishment at Farnborough.** *Great Britain. Meteorological Research Committee, MRP,*

No. 484, April 14, 1949. 16 p. 25 figs., 6 tables, 8 photos, 5 refs. Mimeographed. **DWB**—It has been found that radar echoes are useful in locating the area within Cu-clouds where the largest size drops exist (probably the areas of greatest updrafts, severe turbulence) but the problem becomes how to distinguish areas of greatest turbulence in the absence of large drops. Study of radar weather echo records and accelerometer data from Spitfire aircraft indicate that distinct columns and troughs in the radar echo vertical cross sections are associated with up and down drafts respectively and are indicative of the severity of turbulence to be expected. *Subject Headings:* **1. Turbulence in clouds 2. Cumulonimbus clouds 3. Radar echoes.**

3K–136 551.510.535:551.506.7:621.396.11

†Mitra, S. N., **A radio method of measuring winds in the ionosphere.** *Institution of Electrical Engineers, London, Proceedings*, Pt. 3, 96(43):441–446, Sept. **1949.** 10 figs., 14 refs., 8 eqs. **DLC**—From the fading observed at three radio wave receivers about 100 m apart, "it is possible to deduce that the E-layer has an irregular structure in which the smallest size of irregularity is about 200 m, and that the irregularities move with random turbulent speeds of about 1 m sec." (*Same item as* 9–49, Sept. 1950, *MAB.*) *Subject Headings:* **1. Ionospheric turbulence 2. Ionosphere 3. E layer.**

3K–137 551.551

Mook, Conrad Payne, **An analysis of the meteorological conditions associated with strong clear air turbulence near Chicago on August 3, 1939.** U. S. Weather Bureau, Feb. **1949.** 5+p. 14 fold. charts, refs., 5 eqs. **DWB**—Severe turbulence was reported in clear air at 6000 ft. elev., south of Chicago at a time when an unusual "dry" thunderstorm was reported at Chicago. The effective gust velocity was >30 ft/sec. Examination of upper air soundings for Joliet, Ill., at the time of the reported severe turbulence and theoretical considerations of Richardson's criterion, and J. J. GEORGE's "Impact Factor," led to conclusion that turbulence was probably increasing at time of reported conditions, and that such severe turbulence could be predicted under similar conditions, even in the absence of clouds or thunderstorms. *Subject Headings:* **1. Clear air turbulence 2. Richardson criterion 3. Gustiness 4. Joliet, Ill.**—*M.R.*

3K–138 551.551

Port, W. G. A., **High altitude gust investigation.** *Farnborough, England. Royal Aircraft Establishment, Report*, No. Aero 2341, Nov. **1949.** 10 p. 11 figs., 7 fold. tables, 2 refs., eqs. **DNACA**—A discussion of records of normal acceleration and observations of air temperature taken in turbulent air between 20,000 and 40,000 ft over Southern England during about 160 hours ($2\frac{1}{2}$ years) of high altitude research flights. "A relative frequency distribution curve for gust velocities is obtained and an attempt made to correlate turbulence and atmospheric conditions given by radiosonde observations." Maximum gust recorded was 15 ft sec. *Subject Headings:* **1. Clear air turbulence 2. Turbulence measurement 3. Gustiness 4. Southern England.**

3K–139 551.551:551.515.4

Press, Harry and Thompson, J. K., **An analysis of the relation between horizontal temperature variations and maximum effective gust velocities in thunderstorms.** *U. S. NACA, Technical Note*, No. 1917, July **1949.** 12 p. fig., 4 tables, 3 refs. **DWB**—Results of this analysis indicate that the relation when extended to include frontal conditions appears useful for forecasting the intensity of turbulence for thunderstorms in temperate, though not in subtropical regions. (*Same item as* H-219, Aug. 1950, *MAB.*) *Subject Headings:* **1. Thunderstorm turbulence 2. Turbulence forecasting.**—*H.P.K.*

3K–140 551.551 551.510.534

Regener, Erich, **Ozonschicht und atmosphärische Turbulenz.** [Ozone layer and atmospheric turbulence.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 11(2):47–51, **1949.** **DWB**—Normal distribution of ozone and turbulence at various levels and variations in different weather situations. (*Same item as* 5–31, May, 1950, *MAB.*) *Subject Headings:* **1. Atmospheric turbulence 2. Ozone.**—*C.E.P.B.*

3K–141 551.551:629.13

*Starkey, R. D., **Analysis of the accelerations and speeds recorded on B.O.A.C., Constellation Aircraft.** *Farnborough, England. Royal Aircraft Establishment, Technical Note*, No. Structures 48, Oct. **1949.** 8 p. 2 figs., 5 tables, 4 refs., eqs., append. **DNACA**—Velocity-gravity (V-g) records from 3550 BOAC Constellation flight hours across the North Atlantic at approximately 15,000 ft are analyzed. *Subject Headings:* **1. Atmospheric turbulence 2. Gustiness 3. North Atlantic Ocean.**

3K–142 551.551:533.6

Sutton, O. G., **Atmospheric turbulence.** London, Methuen, **1949.** 107 p. 4 figs., 2 tables, refs., index. *Methuen's "Monographs on physical subjects."* **DLC**—A small book which contains the

essence of the series of lectures given by SUTTON in Washington in November 1948. Highly theoretical but based on years of "field-testing" of theory. Chap. entitled: I. Turbulence, II. Meteorology of lower atmosphere, III. Early theories and applications to large-scale phenomena, IV. Mixing length and statistical theories of turbulence, V. Diffusion near the ground, VI. Turbulence in a variable density gradient. (*Same item as* 4-92, April 1950, *MAB.*) *Subject Headings:* **1. Atmospheric turbulence 2. Turbulence theory.**—*M.R.*

3K–143 551.515.4:551.551:551.501.81

Thompson, James K. and Lipscomb, V. W., **An evaluation of the use of the ground radar for avoiding severe turbulence associated with thunderstorms.** *U. S. NACA, Technical Note*, No. 1960, **1949.** 10 p. 2 figs., 3 tables, 3 refs. **DWB**—Effectiveness of ground radar indicated for determining and avoiding regions of severe thunderstorm turbulence in subtropical and temperate regions. Ground radar increasingly effective with increasing altitude from 6,000 up to 25,000 ft. (*Same item as* H–227, Aug. 1950, *MAB.*) *Subject Headings:* **1. Thunderstorm turbulence 2. Radar storm detection.**—*H.P.K.*

3K–144 551.515.4:551.551:629.13

†U. S. Air Weather Service, **Further studies of thunderstorm conditions affecting flight operations: turbulence.** *U. S. Air Weather Service, Technical Report*, No. 105 39, **1949.** 31 p. 9 figs., 8 tables, 15 refs. **DWB**—Gust and draft velocity data obtained from Thunderstorm Project flights around Orlando, Fla. and Wilmington, Ohio, are analyzed and conclusions indicated. (*Same item as* No. H–229, Aug. 1950, *MAB.*) *Subject Headings:* **1. Thunderstorm turbulence 2. Aeronautical meteorology. I. Braham, Roscoe R., Jr. II. Pope, Fred W.**—*H.P.K.*

1950

3K–145 551.551

*Bannon, J. K., **Severe clear air turbulence experienced at high altitude on 2nd and 7th November, 1950.** *Great Britain. Meteorological Research Committee, MRP*, 631, Feb. 1, **1951.** 8 p. 4 figs., 4 tables, 6 refs. **DWB**—Meteorological conditions associated with severe clear air turbulence at about 35,000 ft are discussed in some detail. The turbulence occurred in the region of sharply marked jet streams and was associated with strong vertical wind shear and small Richardson numbers. *Subject Headings:* **1. Clear air turbulence 2. Jet stream turbulence.**

3K–146 551.551:551.515.4:629.13

Brice, D. A., **Cu-nim gusts. Some implications of an important investigation into thunderstorm flying.** *Flight*, London, 57(2142):32–34, Jan. 12, **1950.** 2 photos. **DLC**—A short article concerned with the effect on aircraft of gusts likely to be encountered in thunder clouds. Information regarding maximum violence of gusts to be expected and relative severity of turbulence at different levels based on American experimental flights is included. *Subject Headings:* **1. Thunderstorm turbulence 2. Gustiness 3. Aeronautical meteorology.**

3K–147 551.558.1:551.508.822

Colson, DeVer, **An unusual radiosonde flight at Lander, Wyoming, indicating large vertical motions.** *American Meteorological Society, Bulletin*, 31(10):371–374, Dec. **1950.** 3 figs., 2 tables, 7 refs. **MH-BH**—Radiosonde flights made at 0300Z and 0425Z on Feb. 11, 1949 at Lander, Wyoming, showed irregularities in the ascent rate of the balloon including actual descent during two intervals of the run. These results of the flights, which are presented tabularly, indicated the presence of large vertical air currents. These vertical currents are explained on the basis of: 1) a wave moving on a temperature inversion surface and 2) by the applications of QUENEY's studies of the air-flow over mountain barriers. Fluctuations in surface pressure recorded on a barograph tracing during the time of the radiosonde flights lend weight to the first explanation. (*Same item as* 2.7–126, July 1951, *MAB.*) *Subject Headings:* **1. Vertical currents 2. Balloon ascension rates 3. Lander, Wyoming.**—*I.L.D.*

3K–148 551.511:551.588.2

Förchtgott, Jiří, **Aplikace Kármánovy cesty víru na pomeřy v atmosfeře.** [Application of von Kármán's vortex paths to atmospheric conditions.] *Meteorologické Zprávy*, 3(4–5):57–63, Feb. **1950.** 8 figs., 5 refs. **MH-BH**—Applying von Kármán's vortex theory under conditions such as are encountered in Czechoslovakia, the author considers waves above and waves behind an obstruction and discusses and illustrates graphically the effect of obstacles on cloud formation, temperature, etc. Other topographic effects on wind and turbulence are analyzed in connection with the above theory. (*Same item as* 6-34, June 1950, *MAB.*) *Subject Headings:* **1. Turbulence in the frictional layer 2. Vorticity 3. Orographic effects 4. Czechoslovakia.**—*M.R.*

3K–149 551.551:551.509.39

Frank, S. R., **Analysis of intermediate level turbulence and a proposal for forecasting turbulent areas.** Trans. World Airlines, Inc., Meteorological Dept. [1950?] 10 p. 15 figs. **DWB**—Criteria for estimating intensity of turbulence from stability and wind shear conditions are outlined briefly. Data obtained during the spring of 1949 from pilots on TWA routes across the United States and from radiosonde and upper air charts are analyzed to test theoretical against empirical graphs and to see if forecasts of degree of turbulence could not be made from upper air charts and diagrams. Types of synoptic patterns, lapse rates and orography are then produced for future use in connection with composite turbulence charts derived from actual pilots' reports. *Subject Headings:* **1. Orographic turbulence 2. Turbulence forecasting 3. Richardson criterion.**

3K–150 551.551:551.510.53

Goody, R. M., **The experimental determination of the thermal state of the lower stratosphere.** (In: Royal Meteorological Society, **Centenary Proceedings, 1950**:9–18. **1950.** fig., 25 refs., eqs.) **MH-BH**—Turbulence near the tropopause may be estimated from the distribution of gases in stratosphere by measurements of diffusion of particles, and through observations of the behavior of balloons and aircraft. (*Same item as* 2.3–50, Mar. 1951, *MAB.*) *Subject Headings:* **1. Clear air turbulence 2. Stratosphere 3. Tropopause turbulence.**—*C.E.P.B.*

3K–151 551.551:551.513.2:551.557

§Harrison, Henry T., Jr., **Some characteristics of the upper level LOW and the jet stream.** *United Airlines, Inc., Meteorology Circular,* No. 34, Jan. 3, **1950.** 21 p. 12 figs. **DWB**—Clear air turbulence at flight levels between 15,000 and 25,000 ft will often be found near the periphery of the cold LOW at 18,000 ft (500 mb) or in the vicinity of the jet stream. Cases of turbulence seemed closely related to sudden and decided changes in wind speed and temperature horizontally. *Subject Headings:* **1. Clear air turbulence 2. Jet stream turbulence 3. Horizontal wind shear.**—*From author's abstract.*

3K–152 551.551

Hislop, G. S., **Gusts—from a clear sky.** *Aircraft,* Melbourne, 29(3):18–19, 40–41, Dec. **1950.** 5 figs., table, eqs. **DLC**—As a result of more than 90,000 miles of flight with two Mosquito Aircraft over Europe at levels between 15,000 and 37,000 feet, it was concluded that a marked wind gradient in the vertical associated with strong horizontal temperature gradient was the most likely cause of turbulence. Half of the cases of high level turbulence were within 2,000 ft of the tropopause. *Subject Headings:* **1. Clear air turbulence 2. Gustiness 3. Tropopause turbulence.**—*M.R.*

3K–153 551.554:551.551

Inoue, Ei-ichi, **On the structure of wind near the ground, III, IV, V.** *Meteorological Society of Japan, Journal, 2nd Ser.,* 28(10):367–376, Oct. **1950;** 29(1,2):14–19, 59–66, Jan., Feb. **1951.** figs., table, refs., eqs. In Japanese, English summaries p. 223, (19), (65). **MH-BH**—Mathematical discussion and observation of natural winds show that the time of passage and scale of the largest effective eddy are proportional to the period of observation, T, and those of the smallest eddy, to $T^{1/3}$. The vertical structure of the wind is regarded as made up of mean flow and eddies of many stages of diameter. The diameters of the largest eddies are proportional to the height, but their vertical velocity is independent of height. These large eddies derive their energy from the mean flow and pass it on to smaller eddies. The thickness of the laminar sublayer is defined by the limiting application of this theory. The largest (or coupling) eddy is considered to maintain the connection between the horizontal and vertical wind structure. The largest eddy observed usually increases with time. (*Same item as* 3.3–158, Mar. 1952, *MAB.*) *Subject Headings:* **1. Atmospheric turbulence 2. Wind structure.**—*C.E.P.B.*

3K–154 551.551

Junge, Christian, **Zur Anwendung des Richardson'schen Kriteriums in der freien Atmosphäre.** [On the application of Richardson's criterion in the free atmosphere.] *Annalen der Meteorologie,* 3(9–10):298–301, **1950.** fig., 7 refs., eq. **MH-BH**—Richardson's number (Ri) is calculated for the free air for different vertical gradients of wind and potential temperature. High values found in stratosphere. Most authors consider that turbulence is only possible when Ri is much below one, so that very little turbulence is to be expected. Observations however, show that it is widespread; inversions are one source. The ratio of the *austausch* coefficients for heat and momentum must be much less than Pettersen and SWINBANK's value of 0.65, but may be very variable in the stratosphere, and this limits the applicability of Ri. *Subject Headings:* **1. Clear air turbulence 2. Stratosphere 3. Richardson criterion.**—*C.E.P.B.*

3K–155 551.551:551.524.4

Neumann, J. and Schwarz, U., **A case of strong turbulence under an inversion.** *Meteorological Magazine,* London, 79(942):346–348, Dec. **1950.** table, eq. **MH-BH**—In morning of April 18,

1950 at Lydda airport, strong turbulence was reported up to 3000 ft. There was an inversion from 20.8°C at surface to 25.4°C at 3000 ft with a strong wind shear. Richardson number calculated as about 0.7. *Subject Headings:* **1. Clear air turbulence 2. Temperature inversions 3. Lydda, Palestine.**—*C.E.P.B.*

3K–156 551.551 551.543.3

Ramakrishnan, K. P., **Wave patterns on some anemograms of Madras.** *Indian Journal of Meteorology and Geophysics*, 1(4):312–314, Oct. **1950.** 3 figs., 3 refs. **DWB**—Some very peculiar anemograms are reproduced. Regular waves of 90° amplitude in direction and 6 mph velocity appear with an amplitude of about 15 min. Many similar cases are cited and causes discussed. (*Same item as* 2.3–107, March 1951, *MAB.*) *Subject Headings:* **1. Turbulence measurement 2. Anemograms 3. Madras, India.**—*M.R.*

3K–157 551.551

Research into clear gusts. *Aeroplane*, London, 78(2020):237–238, Feb. 24, **1950.** 2 photos. **DLC**—A brief review of two years of clear air gust investigations during which BEA's Gust Research Unit flew more than 90,000 mi at heights between 15,000 and 35,000 ft. Only conclusive discoveries are that turbulence occurs most often near the tropopause and near jet streams. (*Same item as* 9–99, Sept. 1950, *MAB.*) *Subject Headings:* **1. Clear air turbulence 2. Jet stream turbulence 3. Tropopause turbulence.**

3K–158 551.551:629.13

Russell, A. F., **Design of turboprop transports. Part I.** *Flight*, London, 56(2140):831–833, Dec. 29, **1949. Part II.** *Ibid.*, 57(2141):26–27, Jan. 5, **1950.** figs., tables. **DLC**—In his comments on the subject of gust effects in relation to aircraft design, the author classifies clear-air gusts as a nuisance but not a menace. *Subject Headings:* **1. Clear air turbulence 2. Aircraft design.**

3K–159 551.551:551.588.2

Serra, Antonio, **Note di climatologia della Sardegna. I—Turbolenza e vortici sul massiccio montuoso del Sarrabus.** [Note on climatology of Sardinia. I—Turbulence and eddies over the Sarrabus Range.] *Rivista di Meteorologia Aeronautica*, 10(1):29–32 Jan.–March **1950.** 4 figs., ref. Italian, French, English and German summaries p. 29. **MH-BH**—The effect of the mountain ranges in southern Sardinia on the westerly and northwesterly winds is discussed and illustrated. In certain situations peculiar cloud forms and attending turbulence are observed at the surface and aloft over these mountains. (*Same item as* 2.1–118, Jan. 1951, *MAB.*) *Subject Headings:* **1. Orographic turbulence 2. Topographic effects 3. Sarrabus Range, Sardinia.**—*M.R.*

3K–160 551.551

Shiotani, M. and Yamamoto, G., **Atmospheric turbulence over the large city—Turbulence in the free atmosphere (2nd report).** *Geophysical Magazine*, Tokyo, 21(2):134–145, Mar. **1950.** 10 figs., 10 refs., eqs. **DWB**—From variations of wind velocity measured with hot-wire anemometers at 60, 55, 45, 35 and 25 m above ground, the frequency distribution of velocity fluctuation, mean velocity, the intensity and scale of turbulence, the spectrum of turbulence and eddy viscosity were calculated. *Subject Headings:* **1. Turbulence in the frictional layer 2. Eddy viscosity 3. Tokyo, Japan.**

3K–161 551.551:629.13

Turbulent prospects. *Flight and Aircraft Engineer*, London, 57(2142):31, Jan. 12, **1950. DLC**—Clear air gusts as affecting aircraft design and operation discussed briefly. Considered as a nuisance but not likely to produce damage or injury to passengers (of order of 0.2 to 0.3 g rather than say 2 g as in CuNb). *Subject Headings:* **1. Clear air turbulence 2. Gust loads.**

1951

3K–162 551.551:551.557:629 13

Bannon, J. K., **Meteorological aspects of turbulence affecting aircraft at high altitude.** *Great Britain. Meteorological Office, Professional Notes*, No. 104; *M.O.* 524d. **1951.** 16 p. 15 tables, 11 refs. **DWB**—Results of a series of special flights to collect data on high level turbulence (20,000 to 40,000 ft) made by the R.A.F. and British Ministry of Supply over southern England between July 1946 and November 1948, and by BEA over Western Europe (20,000 to 37,000 ft) are analyzed. Out of 7600 flights, turbulence was encountered in more than half and bumpiness in the stratosphere was reported in 62 instances. Turbulence cases are analyzed according to Richardson's number (R_i) which has been computed for all cases as well as for turbulence cases over English Midlands and for stratosphere and upper troposphere. Bumpiness is most likely in regions of (a) clouds, (b) jet streams, (3) tropopause and occurs with both horizontal and vertical shear. (*Same item as* 3.2–119,

Feb. 1952, *MAB.*) *Subject Headings:* **1. Tropopause turbulence 2. Jet stream turbulence 3. Great Britain.**—*M.R.*

3K–163 551.551:551.557:629.13

§Bannon, J. K., **Severe turbulence encountered by aircraft near jet streams.** *Meteorological Magazine*, London, 80(951):262–269, Sept. **1951.** 4 figs., 2 tables, 8 refs. **MH-BH**—Records of severe turbulence at 30–40,000 ft over Britain on Nov. 14, 1949 and Nov. 2 and Nov. 7, 1950, are tabulated with surface synoptic charts and compared with characteristics of jet stream on same dates. Turbulent areas are shown on a mean cross section of jet for the 3 days. They were nearly all on low pressure side of jet axis. Strong wind shear in the vertical is suggested as the cause. (*Same item as* 3.2–120, Feb. 1952, *MAB.*) *Subject Headings:* **1. Clear air turbulence 2. Jet stream turbulence 3. Aeronautical meteorology.**—*C.E.P.B.*

3K–164 551.551:551.557

Bannon, J. K., **Turbulence at high altitude: a further meteorological analysis.** *Meteorological Magazine*, London, 80(953):331–332, Nov. **1951.** table, 7 refs. **MH-BH**—Summarizes an analysis (*MRP*, No. 660, London 1951) of turbulence between 18,000 and 40,000 ft in 1950 compared with upper air data. In most cases turbulence was associated with wind shear. Turbulence without shear may be due to degradation of large eddies. (*Same item as* 3.3-153, March 1952, *MAB.*) *Subject Headings:* **1. Clear air turbulence 2. Upper air winds 3. Atmospheric eddies.**—*C.E.P.B.*

3K–165 551.551:551.557

Bindon, Hedley Hugh, **Clear-air gusts in the upper troposphere over eastern Canada.** *Weather*, 6(5):152–153, May **1951,** 5 photos. **DWB**—Account of report by C. F. Levy on turbulence reported by pilots in clear air at about 25,000 ft over Canada on Sept. 21, 1950, illustrated by photos of roll-type and small-scale cellular cloud structure. *Subject Headings:* **1. Clear air turbulence 2. Gustiness.**—*C.E.P.B.*

3K–166 551.551 551.558.1

Byram, George M. and Nelson, Ralph M., **The possible relation of air turbulence to erratic fire behavior in the southeast.** *U. S. Forest Service, Fire Control Notes*, 12(3):1–8, July **1951.** fig., 5 refs. **DWB**—It has been suggested by Gisborne and by Foley (1947) that atmospheric stability or turbulence may be an important and hitherto overlooked factor in bad forest or brush fire situation. In this short but very pertinent paper, the author presents soundings and stability data for Charleston, South Carolina on days when serious fires occurred in the vicinity. It was found that bad fires occur with stable conditions when strong winds and low humidity increase the hazard, but these fires are more easily controlled than are those which occur on days with steep lapse rates. Turbulence causes burning matter to be carried to great heights and showered in an erratic manner which defies control. Also winds become gusty, tornado-like and unpredictable. In the West, dust devils are a good sign of great instability and hence fire danger. *Subject Headings:* **1. Turbulence in the frictional layer 2. Vertical currents 3. Fire weather conditions 4. Charleston, S. C.**—*M.R.*

3K–167 551.551:551.524.4:551.571.4

Churinova, M. P., **O turbulentnosti v nekotorye dni s kuchevymi oblakami.** [Turbulence on certain days with cumulus clouds.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, 24(86):20–26, **1951.** 4 figs., 7 tables, 3 refs., eqs. **DLC**—Temperature, humidity and wind soundings were made at 2 hour intervals at elevations from 0.2 to 3 km on several clear days and on one cloudy day (convective clouds). Richardson's number was calculated for every time interval and elevation. The mean vertical gradient of daily temperature and the daily march of turbulence during these two weather types are determined and discussed. (*Same item as* 3.5-215, May 1952, *MAB.*) *Subject Headings:* **1. Turbulence in clouds 2. Cumulus clouds 3. Vertical temperature gradient 4. Richardson criterion.**—*I.L.D.*

3K–168 551.551

Clear air turbulence. *Esso Air World*, New York, 3(5):128–130, March–April **1951.** 5 figs. **DWB**—Popular article with considerable technical information on clear air turbulence, methods of instrumentation and observations at 15,000–35,000 ft, and advice to pilots for avoiding areas of turbulence (such as in *jet stream* or near the tropopause). *Subject Headings:* **1. Clear air turbulence 2. Jet stream turbulence 3. Tropopause turbulence.**—*M.R.*

3K–169 551.501.8:551.551

Fleisher, Aaron, **Sampling theory as applied to the measurement of turbulence by radar.** Paper read before the joint meeting of American Meteorological Society and American Geophysical Union

in Washington, D. C., May 2–4, 1951. Original unchecked.—"Variations in the strength of radar echoes are related to the relative velocity of the scatters. These data can yield some information about the intensity and scale of atmospheric turbulence . . . ." (*Same item as* 2H–208, Aug. 1951, *MAB.*) *Subject Headings:* **1. Turbulence measurement 2. Radar storm detection.**

3K–170 551.551:551.556.4

Hardy, Albert V., **Analyzing turbulence by means of photographs of airborne particles.** *American Geophysical Union, Transactions*, 32(6):853–860, Dec. **1951.** 5 figs., table, 8 refs., 14 eqs. **MH-BH**—Lint particles floating in the air were photographed by the stereographic method using two synchronized cameras, a method introduced by Miller, Badgley and Singer (1949) to study details of atmospheric turbulence. Inaccuracies were analyzed. The rates of settling of 624 particles were measured and the frequency distribution of their fall velocities presented in a histogram. *Subject Heading:* **1. Turbulence measurement.**—*M.R.*

3K–171 551.551:629.13

Harrison, Henry T., Jr., **Some meteorological problems indicated for jet transport operation at 40,000 ft.** *Aeronautical Engineering Review*, New York, 10(4):52–61, April **1951.** 13 figs., 6 refs. Abstracted from reprint. **DWB, DLC**—Temperature, wind and turbulence are the three most important factors affecting flight at 40,000 ft. Statistics are presented to show the magnitude of these factors and the success which present-day forecasting methods achieve for jet transport operation at these levels. (*Same item as* 3.1–17, Jan. 1952, *MAB.*) *Subject Headings:* **1. Clear air turbulence 2. Upper air flights 3. Jet aircraft 4. Aeronautical meteorology.**—*M.R.*

3K–172 551.551

Hislop, G. S., **Clear air turbulence over Europe.** *Royal Aeronautical Society, Journal*, 55(484): 185–225, April **1951.** 14 figs., 2 tables, 19 refs. **DWB**—A comprehensive summary of observations and experiments made by the Ministry of Supply with cooperation of the Meteorological Office and the Ministry of Civil Aviation using BEA. equipment, between April 1948 and Jan. 1950, over Europe. Meteorological aspects are discussed at length (relation to tropopause, jet stream, vertical currents, wind speed, fronts, terrain, etc.). Data compared with that from U.S.A. (United Airlines) and BOAC, de Haviland, etc. in the United Kingdom. Chart shows path of flights. Type maps show synoptic situations favorable for high-level turbulence. *Subject Headings:* **1. Clear air turbulence 2. Europe.**—*M.R.*

3K–173 551.558.21:797.5

Kessel, Emil, **Soaring waves at Warm Springs Airport.** *Soaring*, 15(4):10, July/Aug. **1951.** graph. **DLC**—A schematic diagram shows relation of wave to topography from San Francisco Bay to altitude of 6000 ft to the lee of a 1500 ft ridge. At times the wave extends to 7200 ft and has been known to give lift to a glider to 12,500 ft. Area of greatest turbulence is shown to be along inversion surface between NW (cold maritime) and NE (warm continental) air. (*Same item as* 3.6–127, June 1952, *MAB.*) *Subject Headings:* **1. Orographic turbulence 2. Standing waves 3. Gliding 4. San Francisco Bay, Calif.**—*M.R.*

3K–174 551.551

Phillips, P. E., **Clear-air turbulence.** *Meteorological Magazine*, London, 80(954):361–362, **1951.** fig. **DWB**—A case of severe turbulence (estimated acceleration, 9 g) in clear air at approximately 4,000 ft over south Malaya was thought possibly due to an eddy of horizontal axis. (*Same item as* 3.6–128, June 1952, *MAB.*) *Subject Headings:* **1. Clear air turbulence 2. Malaya.**

3K–175 551.551:629.13

Press, Harry and McClanahan, Herbert C., Jr., **Flight investigation of the effect of atmospheric turbulence on the climb performance of an airplane.** *U. S. NACA, Technical Note*, No. 2498, Oct. **1951.** 30 p. graphs, tables, refs. **DWB**—Average rate of climb for a series of flights with single engined planes was not effected by clear air turbulence over flat terrain. Standard deviation of rate of climb was greater in rough than in smooth air, and decreased rapidly with increased duration of climb. Turbulence data as well as performance data are given in tables and graphs. *Subject Headings:* **1. Clear air turbulence 2. Gustiness 3. Aeronautical meteorology.**—*M.R.*

3K–176 551.551(4)

Saito, N., **On the turbulence in the lower troposphere.** *Meteorological Society of Japan, Journal, 2nd Ser.*, 29(11):378–383, Nov. **1951.** 4 figs., 5 refs. **MH-BH**—"Medium scale" turbulence in the lower troposphere is described. The diffusion of volcanic ashes, convective cells and the turbulence of wind is examined. Richardson's law is verified. *Subject Headings:* **1. Turbulence in the frictional layer 2. Richardson criterion.**—*A.A.*

3K–177 551.551(4)

Scorer, R. S., **Clear-air turbulence over Europe.** *Weather*, 6(2):59–60, Feb. **1951. DWB**—Account of a joint meeting of Royal Aeronautical and Meteorological Societies on Dec. 14, 1950 which was opened by G. S. Hislop. Vertical accelerations much greater than g/2 are encountered over Europe in strips 50 miles wide and 2–3000 ft. deep, in stable lapse rate. No explanation can be given. (*Same item as* 2.6–80, June 1951, *MAB.*) *Subject Headings:* **1. Clear air turbulence 2. Europe.**—*C.E.P.B.*

3K–178 551.551:797.5

Sierra Wave Project, **Flight 2006, Dec. 18, 1951.** 4 p. table. **Flight 2007, Dec. 18, 1951.** 3 p. (Copies at U. S. Air Force Cambridge Research Center and University of California at Los Angeles.)—Pilot reports of clear air turbulence encountered between approximately 30,000 and 40,000 ft in soaring flight over the Sierra Range (*see* 3K–197 below). *Subject Headings:* **1. Clear air turbulence 2. Orographic turbulence 3. Gliding 4. Sierra Nevadas, Calif. I. Laurence, Edgar (*pilot*).**

3K–179 551.551:551.507.321.4

Stewart, H. J. and MacCready, P. B., Jr., **Progress report on investigation of atmospheric turbulence.** California Institute of Technology, April **1951.** 31+p. 28 figs. **DWB**—A report on the developments in instrumentation and observational technique for study of atmospheric turbulence in the layer of air within 300 m of the ground. Hot wire anemometers and thermistors were placed along a cable between the ground and a captive balloon, with recording made at surface by means of lead wires from instruments. Lapse rates, wind gradients, heat and momentum flux and turbulent fluctuation in elements derived from these records. Work up to date of report was mainly exploratory—checking range of sensitivity, coordination and errors. Equipment is shown in numerous excellent photographs and performance indicated by graphs and charts. *Subject Headings:* **1. Turbulence measurement 2. Hot wire anemometers 3. Captive balloons.**—*M.R.*

3K–180 551.551:551.554:629.13

Thompson, James K., **A relation of wind shear and insolation to the turbulence encountered by an airplane in clear-air flight at low altitudes.** *U. S. NACA, Research Memorandum*, L51H07, Sept. 13, **1951.** 12 p. 3 figs., table, 6 refs. **DWB**—Results of 23 flights in clear air at 1500 ft above ground near Wilmington, Ohio. Computed coefficients of correlation between the quantity rv/h (daily solar radiation × wind shear) and the effective gust velocities were .88 and .84. *Subject Headings:* **1. Clear air turbulence 2. Gustiness.**

3K–181 551.551:551.507.352

Tolefson, H. B. and Gurtler, C. A., **An investigation of a method to indicate atmospheric turbulence from an airplane in flight.** *U. S. NACA, Research Memorandum*, L50K29a, July 9, **1951.** 18 p. 7 figs., 4 refs. **DWB**—An instrument has been designed and tested, and the results of tests during last half of 1948 presented, for determining degree of turbulence encountered by an airplane in flight. A vented air speed diaphragm is placed in a sealed case so that only the short sudden accelerations are transmitted to the recorder, and gradual changes in air speed, except for those due to climbing or descending, are eliminated from record. Details given in text, graphs and tables, and equipment shown in photographs. *Subject Headings:* **1. Turbulence measurement 2. Air-borne gust recorders 3. Aeronautical meteorology.**—*M.R.*

3K–182 551.551:629.13

Trans World Airlines, Inc., **Effect of squally winds on air speed.** *TWA, System Operations Bulletin*, No. 51–24, Sept. 6, **1951,** Kansas City, Mo. 2 p. 2 figs. Mimeographed. **WB-AS**—A case is described and illustrated of dangerous (near stalling) loss of airspeed experienced by an aircraft passing through a sharp wind shift line. Airspeed drops of this variety are particularly dangerous during take-offs and landings and when the plane is banked. *Subject Headings:* **1. Turbulence in the frictional layer 2. Wind shift line 3. Aeronautical meteorology.**

3K–183 551.558.1:629.315

U. S. Civil Aeronautics Board, **United Air Lines, Inc., Fort Wayne, Indiana, April 28, 1951.** *U. S. Civil Aeronautics Board, Accident Investigation Report*, CA-234, File No:1–0024, Oct. 22, **1951.** 4 p. diagrs., 2 appends. **WB-AS**—An official report of the crash of a DC-3 when caught in severe down drafts and turbulence (gusts up to 85 mph) associated with a squall line. *Subject Headings:* **1. Thunderstorm turbulence 2. Squall lines 3. Aeronautical meteorology.**

3K–184 551.515.4:551.551:656.7

U. S. Weather Bureau, **Causes and characteristics of thunderstorms and other atmospheric disturbances.** *U. S. Weather Bureau, Third Interim Report*, June **1951.** 27 p. 54 refs. **DWB**—

A summary of important investigations already completed, in progress or to be undertaken under Public Law 657—80th Congress. Particular studies mentioned are: the Thunderstorm Project, radar navigation and storm detection, turbulence studies (in storms), free air turbulence, tornadoes, cloud physics, etc. (*Same item as* 3.5–151, May 1952, *MAB.*) *Subject Headings:* **1. Thunderstorm turbulence 2. Atmospheric disturbances 3. Meteorological research. I. U. S. Public Law 657.**—*M.R.*

3K–185 551.551

Varley, G. C., **Clear air turbulence.** *Weather*, 6(4):128, April **1951.** **MH-BH**—Suggestion that observation of smoke trails be used in investigating clear air turbulence. *Subject Heading:* **1. Clear air turbulence.**

3K–186 551.551:551.557

Winds and turbulence in the upper atmosphere. *Nature*, London, 167(4251):626–628, April **1951.** table, 8 refs. **DLC**—Report of a discussion of the Royal Astronomical Society in which research to date was summarized and turbulent velocities of about 25 m/sec at 90 m and instances of turbulence at levels up to 300 km were reported. (*Same item as* 3.6–75, June 1952, *MAB.*) *Subject Headings:* **1. Clear air turbulence 2. Upper air winds 3. Ionosphere.**

1952

3K–187 551.551:551.515.2

Arakawa, H., **Severe turbulence resulting from excessive wind-shear in tropical cyclones.** *Journal of Meteorology*, 9(3):221–223, June **1952.** 2 figs., 10 refs., 7 eqs. **DWB**—Criteria for increase of turbulence are discussed. Author's 1941 expression $\partial v\theta/\partial r > 2v\theta/r$ (r = radius of curvature) is evaluated for center of a typhoon. Results agree with observations on a flight into a typhoon in showing strong shear and turbulence 5 mi inside typhoon eye. *Subject Headings:* **1. Atmospheric turbulence 2. Typhoons.**—*C.E.P.B.*

3K–188 551.515:551.551:551.557

Bannon, J. K., **Weather systems associated with some occasions of severe turbulence at high altitude.** *Meteorological Magazine*, London, 81(958):97–101, April **1952.** fig., 2 tables, 6 refs. **DWB**—Ninety-two cases of turbulence $\geqslant 0.4g$ above 20,000 ft were classified according to weather situation. Of these, 56 definitely occurred near jet stream; these are plotted on a cross section of a jet drawn from 3 typical cases. Most occurred on low pressure side, some above axis on high pressure side in regions of large vertical or horizontal shear. Eight were associated with tropopause discontinuities. *Subject Headings:* **1. Clear air turbulence 2. Jet stream turbulence 3. Tropopause turbulence.**—*C.E.P.B.*

3K–189 551.551:551.524.7

§Berggren, Roy, **The distribution of temperature and wind connected with active tropical air in the higher troposphere and some remarks concerning clear air turbulence at high altitude.** *Tellus*, 4(1):43–53, Feb. **1952.** 6 figs., refs., 2 eqs. **MH-BH**—Taking advantage of the extensive European radiosonde network in existence today, the author tackles the problem of extending the investigation of fronts into the lower stratosphere. Sea-level charts, 500 mb charts and synoptic aerological cross sections [showing frontal boundaries, tropopauses, inversions, isotherms and isovels (observed wind speed)] serve to illustrate test cases from Oct. and Nov. 1949. A review of recent British investigations of clear air turbulence (*see* 3K–162 and 3K–172 above) and an analysis of an additional example of clear air turbulence by the author comprise the second part of the paper. It is suggested that a detailed study of synoptic aerological charts to determine wind shear at various heights might be the key to the prognostic problems of clear air turbulence. *Subject Headings:* **1. Clear air turbulence 2. Synoptic aerology 3. Tropopause.**

3K–190 551.551:551.557:551.513.2

§Bracelin, P., **Notes on jet streams and turbulence at high levels.** *Great Britain. Admiralty. Naval Weather Service, Circular*, No. 15/52; NWS 161/52. August, **1952.** 7+p. 16 figs., eqs. **DWB**—An excellent summary of information to date on the general characteristics of pressure, temperature and wind fields associated with the jet stream. The movements of the jet stream, its connection with surface fronts and the relations between the jet stream and topography of the tropopause are commented upon. Occurrences of clear air turbulence in the upper troposphere and lower stratosphere generally in the vicinity of the jet stream are discussed. The usefulness of the Richardson number, R, (which takes account of the stability of the air and the vertical wind shear in the layer under consideration) as a parameter for describing atmospheric turbulence is stressed. Figures include vertical cross sections through typical jet streams, surface synoptic charts with superimposed 300 mb winds, and schematic cross sections through a warm front, a folded tropopause

and the confluent entrance to a jet stream. *Subject Headings:* **1. Jet stream 2. Jet stream turbulence 3. High level winds 4. Tropopause.**

3K–191 551.551:551.513.2:551.557 551.551:551.557

Briggs, J., **Turbulence associated with a jet stream.** *Meteorological Magazine*, London, 81(958): 119–120, April **1952.** table. **DWB**—Describes turbulence near jet stream on Nov. 14, 1951, over Great Britain in region of large vertical shear. The turbulence was successfully forecast. *Subject Headings:* **1. Clear air turbulence 2. Jet stream turbulence 3. Great Britain.**—*C.E.P.B.*

3K–192 551.551.7:629.13

Chamberlin, J. A. (*A. V. Roe, Canada, Ltd.*), **The use of meteorological data in aircraft design.** *Royal Meteorological Society, Canadian Branch* [*Publications*], 3(2):1–8, **1952. DWB**—Most important meteorological information used in aircraft design is data on maximum gust velocity, "temperature accountability," winds aloft and icing. The effect of these factors on aircraft is discussed. Various methods of measuring gust velocity in flight are described. *Subject Headings:* **1. Clear air turbulence 2. Gust loads 3. Aircraft design.**—*G.T.*

3K–193 551.551:551.515.4:629.13

Harney, Patrick J., **Why you fly thunderstorms the way you do.** *Aero Digest*, New York, 64(2):78–99, Feb. **1952.** 5 figs., photo. **DLC**—The meteorological conditions which necessitate the observance of rules for "airspeed, altitude and attitude" for pilots traversing thunderstorms are briefly explained. The alignment of thunderstorms and terrain and turbulence to be expected near mountain ranges are discussed. *Subject Headings:* **1. Thunderstorm turbulence 2. Orographic turbulence 3. Aeronautical meteorology.**

3K–194 551.551

Haslett, A. W., **Research report. Atmospheric turbulence.** *Science News*, London, 20:103–106 [**1952?**] 3 refs. **Radio-astronomy.** *Ibid.*, p. 107–110. 5 refs.—Recent work on high level turbulence is summarized—by E. C. S. Megaw in relation to twinkling of stars and propagation of centimeter radio waves, by G. S. Hislop on clear air turbulence as affecting aircraft, and by J. H. McQueen on stirring in the upper air. Results agree with statistical theory of A. N. Kolmogorov. The second article comments that owing to turbulence radio-stars also "twinkle." *Subject Heading:* **1. Clear air turbulence.**—*C.E.P.B.*

3K–195 551.551:797.5

High flight in a mountain lee wave. *The Thermal* (published by Southern California Soaring Association). 14(7):[6–8], June **1952.** Copy in files of Mr. DeVer Colson, U. S. Weather Bureau, Washington, D. C.—Sailplane pilot's report of a routine wave flight made on March 19, 1952 over the Sierra Range for the Sierra Wave Project during which an altitude of over 40,000 ft was attained. Severe turbulence was encountered during the tow in the area of a massive roll cloud over the valley. *Subject Headings:* **1. Orographic turbulence 2. Gliding 3. Lee waves 4. Sierra Nevadas, Calif. I. Sierra Wave Project.**

3K–196 551.551:531.15

Kellogg, William W., **Diffusion of smoke in the stratosphere.** California. University at Los Angeles. Institute of Geophysics, Contract AF 19(122)246, Air Transport Project, Final Report, April **1952.** 12+p. 20 figs., eqs., refs. **DWB**—Data from the High Altitude Dust Diffusion Project on the rate of growth of smoke puffs in the stratosphere showed an increase in rate of growth with height and a decrease with stability. Theoretical analysis of smoke puff growth resulted in an equation describing the visual diameter as a function of time and a variety of turbulence parameters. Comparison between theory and experiments suggests that the mean turbulent velocity is on the order of 4–10 cm/sec in the stratosphere. *Subject Headings:* **1. Clear air turbulence 2. Turbulent diffusion 3. Stratosphere 4. Smoke. I. California. University at Los Angeles. Institute of Geophysics II. Contract AF 19(122)246.**

3K–197 551.551:797.5

Kuettner, Joachim, **On the possibility of soaring on traveling waves in the jet stream.** *Soaring*, 16(3):9–14, May–June, **1952.** 10 figs. **DWB**—Sailplane flights and microbarographic observations indicate the existence in the jet stream of waves (period of 20 to 30 minutes and wave length of more then 20 km) which theoretically travel downwind in a duct between approximately 20,000 and 40,000 ft at a velocity smaller than that of the jet stream. The relation between vertical wind shear and the origin of vertical and horizontal wave motion in the free atmosphere and the physical mechanism by which such motion is altered into standing waves "bounded" within "ducts" of stable air are explained. The author goes on to discuss the dynamic stability of such waves in an attempt to

determine if the jet stream forms such a "duct." In figure No. 9 (p. 14) three curves show 1) altitude vs. time, 2) rate of climb vs. time and 3) indicated speed vs. time for Sierra Wave Project Flight No. 2007 (*see* 3K–178 above) on which severe high level turbulence was encountered. *Subject Headings:* **1. Clear air turbulence 2. Jet stream turbulence 3. Gliding.**

3K–198 551.551:629.13

Massachusetts Institute of Technology. **Gust loads on aircraft.** *Massachusetts Institute of Technology, Reports on Research*, 3(6):3, April, **1952. DWB**—Brief account of progress made "in establishing a more rational basis for prediction of gust loads on modern, high-performance airplanes." *Subject Headings:* **1. Atmospheric turbulence 2. Gust loads 3. Aircraft design.**

3K–199 551.551:551.509.59:551.501.8

Merewether, A. F. and White, F. C. **Storm and clear air turbulence: an analysis of the problem and a search for solution.** *Institute of the Aeronautical Sciences, New York, Preprint*, No. 361, Jan. 28–Feb. 1, **1952.** 10 p. 6 figs., 10 refs. Also in: *Index Aeronauticus, A Review of Technical Information*, London, 8(7):48, July **1952. DWB**—Improved radar will aid greatly in the forecasting and avoidance by aircratt of turbulence in clouds and storms. Attempts at detecting and forecasting clear air high altitude turbulence are being made with the "gustsond," a vibrating arm type instrument which transmits the fluctuation of the arm by radio. *Subject Headings:* **1. Thunderstorm turbulence 2. Radar storm detection.**—*From author's abstract.*

3K–200 551.551:629.13

Mook, Conrad P., **A meteorological analysis of reports of turbulence encountered by aircraft in clear air.** *Aeronautical Engineering Review*, New York, 11(9):22–27, Sept. **1952.** 14 figs., 12 refs. **DWB**—Analysis of pilot reports shows that marked vertical wind shear is usually present at the time when aircraft encounter bumpiness. Turbulence in the vicinity of the jet stream is similar to that found at lower levels and is thought to be partially a function of the speed, heading, and rate of climb of the aircraft. The idea is advanced that changes in airspeed experienced by an aircraft passing through waves on a discontinuity surface might account for some cases of clear air turbulence. The tentative conclusion is reached that bumpiness will be encountered when the vertical shear is sufficient, regardless of the lapse rate of temperature. *Subject Headings:* **1. Clear air turbulence 2. Jet stream turbulence 3. Gustiness.**—*Author's abstract.*

3K–201 551.551.7:551.558.21

Turner, H. S., **Severe turbulence over the Inner Hebrides.** *Meteorological Magazine*, London, 81(962):239–241, Aug. **1952.** fig., ref. **DWB**—A pilot flying from Glasgow to Benbecula (Outer Hebrides, Scotland) in a strong stable SW current on Dec. 21, 1951, noted alternate up and down currents of 500–1000 ft/min, attributed to standing waves of length 6 mi. Over Rhum Island severe turbulence occurred, attributed to interference by a separate wave train set up by the island. *Subject Headings:* **1. Atmospheric turbulence 2. Lee eddies 3. Inner Hebrides.**—*C.E.P.B.*

3K–202 551.551:016

†U. S. Air Force, Air Weather Service. **Bibliography on high-altitude clear-air turbulence in the atmosphere.** *U. S. Air Weather Service, Air Weather Service Bibliography*, No. 8 (rev.), March **1952.** Washington, D. C. 4 p. 46 refs. **DWB**—A 46 item unannotated bibliography of references on high altitude turbulence (above 10,000 ft) of a magnitude sufficient to affect aircraft. *Subject Headings:* **1. Clear air turbulence 2. Bibliographies.**

3K–203 551.551:629.13

Walker, Walter G. and Schumacher, Paul W. J., **An analysis of the normal accelerations and airspeeds of a two-engine type of transport airplane in commercial operations on routes in the central United States from 1948 to 1950.** *U. S. NACA, Technical Note*, No. 2735, July **1952.** 30 p. diagrs., 4 tables. **DLC**—Normal-acceleration and airspeed data obtained from a two-engine type of transport airplane. The gust and gust-load experiences of the airplane are determined from and then compared with similar results from the same type of airplane during past operations. The influences of the gusts and the operating speeds in rough air on the gust-load experience are indicated. *Subject Headings:* **1. Atmospheric turbulence 2. Gustiness 3. Aeronautical meteorology.**—*NACA abstract.*

SUPPLEMENTARY MATERIAL

3K–204 551.551

Diubiuk, A. F., **Turbulentnost' i obmen v svobodnoĭ atmosfere.** [Turbulence and exchange in the free atmosphere.] *Zhurnal Geofiziki*, 5(4):487–498, **1935.** 2 figs., 36 eqs. English summary p. 497–498. **DLC**—The author criticizes the basic postulate of the classic turbulence theory (absence of vertically directed flow of masses), which can be true only for sufficiently long time periods and develops an improved theory for short time intervals, introducing a mean flow proportional to the vertical gradient of potential temperature. The exchange of the air properties is calculated and general equations for the turbulent heat conductivity and the motion of a turbulent stream are given. *Subject Headings:* **1. Turbulence theory 2. Turbulent exchange 3. Atmospheric turbulence.** —*A.A.*

3K–205 551.551:797.5

Bessemoulin, Jean and Viaut, André, **Manuel de météorologie du vol à voile.** [Manual of the meteorology of gliding.] Paris, Èditions Blondel la Rougery, **1948.** 214 p. 143+22 figs. **DCL**—Paragraphs 58 and 59 (p. 58–59) consist of brief comments on the importance of turbulence in aerial navigation, the Darmstadt table for use in evaluating degree of turbulence, and the meteorological import of turbulence particularly in reference to turbulent diffusion and clouds. *Subject Headings:* **1. Atmospheric turbulence 2. Gliding. I. Bakalowicz, R.** (*illus.*)

3K–206 551.524.7:551.558:551.510.53

†Kellogg, William Welch, **Turbulence in the upper stratosphere.** California. University at Los Angeles. Institute of Geophysics, Survey of data and theoretical analysis of the upper atmosphere, Final report, June **1950.** U. S. Weather Bureau Contract Cwb-7904, Pt. II. 12 p. 5 figs., 3 tables, 24 refs., 6 eqs. **DLC**—Knowledge of the radiative balance, observations of temperature lapse rates and deductions from other observed phenomena indicate the existence of an unstable layer and turbulence in the upper stratosphere (approximately 50 to 80 km) above the ozone layer. Fuller understanding of flow in convection patterns and of the coefficients of eddy diffusion and viscosity are necessary to explain this turbulence which will become increasingly important with progress in high altitude flight. *Subject Headings:* **1. Clear air turbulence 2. Stratospheric turbulence. I. Contract Cwb-7904.**

3K–207 551.507.351:551.558.21

Ivans, William S., Jr., **Eight miles high.** *Soaring*, Memphis, Tenn., 15(1):3–5, 12. Jan.–Feb. **1951.** photo, 2 tables. **DWB, DLC**—A detailed account of a record sailplane ascent made by the author on Dec. 30, 1950, when he reached an indicated altitude of 42,000 ft near Bishop, Calif. Turbulence increased as the plane gained altitude but never became dangerous. Just below an altocumulus cloud the turbulence was of peculiar nature similar to driving over a rough road at high speed. Maximum gusts were $+3\frac{1}{2}$ g. (For fuller abstract *see item* 3.9–45, Sept. 1952, *M.A.B.*) *Subject Headings:* **1. Gliding 2. Orographic turbulence 3. Sierra wave 4. Sierra Nevadas, Calif.**—*M.R.*

3K–208 551.557

Sheppard, P. A., **Recent advances in science. Meteorology. The jet-stream and related phenomena.** *Science Progress*, 39(155):483–495, July **1951.** 4 figs., 13 refs. **DWB**—Jet stream defined and described. Its relation to wind shear (critical cyclonic shear being 10 m s per 100 km) and to clear air turbulence are pointed out. (For fuller abstract *see item* 3.1–124, Jan. 1952, *M.A.B.*) *Subject Headings:* **1. Clear air turbulence 2. Jet stream turbulence.**

3K–209 551.513.2:551.557

Baker, Wallace C., **Riding the jet streams.** *Air Facts*, New York, 15(9):39–45, Sept. **1952. DWB**—Popular account of origin and physical properties of jet streams and of methods of their investigation and aeronautical utilization. A balloon sounding over Oklahoma is described and reported to have indicated velocities of 132 knots at 23,000 ft altitude, 200 knots at 25,260 ft and an estimated 310 mph at $5\frac{1}{2}$ miles. "Jet streams," it is explained, "exist in the tropopause zone of the atmosphere" where they originate from temperature inversion due to the absorption of ultraviolet radiation and from the movement of pressure cells. Attention is called to the turbulent layer existing at the base of the stream. *Subject Heading:* **1. Jet stream turbulence.**—*G.T.*

3K–210 551.551:551.557:551.524.7:629.13

Dykes, Christopher, **Some operating problems of future transport aircraft.** *Royal Aeronautical Society, Journal*, 56(495):189–200, March **1952.** 8 figs., table, 3 refs. **DWB**—In the section dealing with "new problems" (p. 197–199) some characteristics of upper air temperature and wind, jet

streams and clear air turbulence are stressed. *Subject Headings:* **1. Upper air winds 2. Clear air turbulence 3. Upper air temperatures 4. Jet stream.**—*G. T.*

3K–211 551.551:551.557

Great Britain. Naval Weather Service, **Notes on jet streams and turbulence at high levels.** *Great Britain. Naval Weather Service, Circular* No. 15/52, Aug. **1952.** 7 p. 16 figs. Mimeographed. **GB-MO**—A survey is made of the general properties of jet streams. The temperature and wind field are briefly discussed together with the relation of the jet stream to surface fronts. The use of Richardson's criterion for decrease or increase of turbulence and the recent work of Bannon on high level turbulence are summarized. No references are given. *Subject Headings:* **1. Clear air turbulence 2. Jet stream.**—*G. J. Evans.*

3K–212 551.551

High altitude clear air turbulence near Muscat on 8 October, 1951. *Indian Journal of Meteorology and Geophysics*, 3(1):41, Jan. **1952. DWB**—Clear air turbulence lasting four minutes experienced at a height of 17,500 ft at position 23°00′N and 59°30′E. Nearest clouds were 2/8 cumulus; air temperature 1°C; ground speed 240 knots. *Subject Headings:* **1. Clear air turbulence 2. Muscat, Arabia.**—*I. L. D.*

3K–213 551.551:551.508.822

Venkiteshwaran, S. P. and Jayarajan, A. P., **Observations of turbulence in the upper air with the F-type radiosonde.** *Indian Journal of Meteorology and Geophysics*, 3(3):203–211, July **1952.** 7 figs., refs. **DWB**—The paper indicates how regions of turbulence in the upper air (as high as the 250 mb level) can be located by an examination of the rate of rotation of the fan in the F-type radiosonde, developed and used in the India Meteorological Department. Diagrams showing changing rate of rotation of fans with height and temperature distribution are included. *Subject Headings:* **1. Clear air turbulence 2. Turbulence measurement.**—*From authors' abstract.*

PART III. METEOROLOGICAL ARTICLES APPEARING IN RECENTLY ISSUED PUBLICATIONS

Note: The contents of periodicals included in this section are for information only, and will not be listed in the monthly indexes until abstracted. When material is furnished in advance of date of publication, the pagination may be omitted.

American Geophysical Union, Transactions, Volume 33, Number 5, Part 1, October 1952.

Sullivan, A. W., VanValkenburg, H. M. and Barney, J. M.: **Low-frequency atmospheric radio noise in Florida,** p. 650–656.

Hess, V. F., Burns, W. F. and Parkinson, W. D.: **Gamma radiation from Uranium X_2,** p. 657–660.

Lake Herman: **A comparison on the power law and a generalized logarithmic formula in micrometeorology,** p. 661–668.

Yih, Chia-shun: **Laminar free convection due to line source of heat,** p. 669–672.

Benton, George S. and Covey, Winton: **Measurement of meteorological variables by use of multiple energy-balance indicators,** p. 673–679.

Ketchum, Bostwick H. and Ford, William L.: **Rate of dispersion in the wake of a barge at sea,** p. 680–684.

Putz, R. R.: **Statistical distributions for ocean waves,** p. 685–692.

Chien, Ning: **The efficiency of depth-integrating suspended-sediment sampling,** p. 693–698.

Bethlahmy, Nedavia: **A method for approximating the water content of soils,** p. 699–706.

Bryson, R. A. and Suomi, V. E.: **The circulation of Lake Mendota,** p. 707–712.

Carstens, M. R.: **Accelerated motion of a spherical particle,** p. 713–721.

Hurley, Patrick M. and Shorey, Russell R.: **Discrimination of thoron alpha activity in presence of radon,** p. 722–724.

Fries, Carl, Jr. and Gutiérrez, Celedonio: **Activity of Parícutin Volcano from July 1 to December 31, 1951,** p. 725–733.

Időjárás, Budapest, Volume 56, Number 5/6, May/June 1952.

Lakatos, Alfréd: **A tudományok megbecsülése,** [Appreciation of science], p. 129–130.

Botvay, Károly: **Adatok a tavak és folyók parti környezetének éghajlatához,** [Some contributions to the knowledge of climate on the shores of lakes and rivers], p. 131–144.

Bodolai, István: **Az advektív-dinamikus analízis alapelvei V. rész,** [The principal fundamentals of the analysis of dynamic advection. Part V.], p. 145–155.

Szász, Gábor: **A szinoptika tanításának kérdése geográfiai szempontból,** [The problem of synoptic teaching from the geographic point of view], p. 155–156.

Aujeszky, László: **A légszennyezés meteorológiájának alaptényei,** [Fundamental principles of the meteorological aspects of atmospheric pollution], p. 157–160.

Bacsó, Nándor: **Makro-, mezo- és mikroklíma adatainak felhasználása a légszennyezés vizsgálataihoz,** [Utilization of macro-, meso- and micro-climatic data for the study of atmospheric pollution], p. 160–163.

Berkes, Zoltán: **A korszerü idöelörejelzés alapfogalmai. (SZ. P. Hromov müvének ismertetése),** [Fundamental ideas of modern forecasting. (Review of the work of S. P. KHromov)], p. 164–167.

Varga, Miklós: **A hideg talajok fiziológiai szárazságáról,** [Physiological dryness of cold soils], p. 167–168.

Instruments and measuring instruments

Kakas, Jósef: **Az altalaj hömérsékletének mérése,** [Measurement of the subsoil temperatures], p. 169–173.

The recent weather

Aujeszky, László: **Frontátvonulási jegyzék Budapeströl 1952. április 1—június 30-ig,** [Calendar of frontal passages, Budapest, April 1–June 30, 1952], p. 174–176.

Aujeszky, László: **Légtömegnaptár, Budapestvöl, 1952. április 1—június 30,** [Air masses, Budapest, April 1–June 30, 1952], p. 176–177.

Bacsó, Nándor: **Magyarország idöjárása 1952. április—június havában,** [Weather conditions in Hungary, April–June 1952], p. 178–181.

Dezsö, Loránt: **A Nap felületének jelenségei 1952. március—május,** [Solar activity, March to May 1952], p. 181–182.

Popular meteorology

Hegyi, István: **Tél a tavaszban,** [Winter in spring], p. 182–186.

Németh, László: **Méhészet és a meteorológia,** [Apiculture and meteorology], p. 186–187.

Reviews

Útmutatás a meteorológiai megfigyelésekre, [Instructions for meteorological observations], p. 188–193.

News

Az Országos Balneológiai Kutatóintézet klimakutató osztálya, [Climatic Research Division of the National Balneological Institute], p. 193–194.

A Magyar Meteorológiai Társaság Ügyei, [Business of the Hungarian Meteorological Society], p. 194–195.

Régi Magyar Megfigyelések, [Historical Hungarian observations], p. 195.

Japan. Central Meteorological Observatory. Tokyo. Oceanographical Report, Volume 2, Number 1, May 1951.

Miyazaki, M., Yoshizawa, H. and Ushioda, T.: **Meteorological tides caused by the typhoon "Kezia" along Japanese Coasts in the dangerous semicircle,** p. 75–86.

Fukuoka, J.: **On the oceanographical conditions of the sea area east off Erimozaki, Hokkaido,** p. 87–92.

Japan. Central Meteorological Observatory. Tokyo. Oceanographical Report, Volume 2, Number 2, December 1951.

Toyama Weather Station: **Observations of sea waves at the Port of Toyama,** p. 95–102.

Miyazaki, M.: **Destructive waves caused by heavy storms in Osaka Bay,** p. 103–114.

Masuzawa, J.: **On the transport of Kuroshio Current south off Shionomisaki,** p. 114–118.

Ichiye, T. and Nagao, C.: **On the annual variations of water temperature in the Kii Suido Pt. I and Pt. II,** p. 119–139.

Koizumi, M.: **On the oceanographical conditions around the fixed point "X-Ray" (Lat. 39°N, Long. 153°E) (1948 to 1949),** p. 163–169.

Hanzawa, M.: **On some interesting marine meteorological phenomena observed in and en route to and from the Antarctic Ocean,** p. 177–182.

Ichiye, T.: **On the abnormal high water caused by the typhoon "Jane,"** p. 191–198.

Hishida, K.: **Forecast of surface water temperature in the south-western part of Japan Sea,** p. 199–204.

The minutes of symposium and business meeting for forecasting oceanographical conditions, at the first conference of technic for oceanographical observation (September 26–27, 1951), p. 205–206.

List of oceanographical works made in the meteorological offices of Japan after the World War II (1945–50), p. 207–217.

Journal of Atmospheric and Terrestrial Physics, Volume 2, Number 6, 1952.

Deb, S.: **Nitrogen in the upper atmosphere,** p. 309–323.

Davids, Norman: **Theoretical group heights of reflection of 150 kc/s radio waves vertically incident on the ionosphere,** p. 324–336.

Chalmers, J. Alan: **Electric charges from ice friction,** p. 337–339.

Dieminger, Walter: **Über die Ursache der excessiven Absorption in der Ionosphäre an Wintertagen,** [On the causes of excessive absorption in the ionosphere on winter days], p. 340–349.

Smith, F. G.: **Ionospheric refraction of 81.5 Mc/s radio waves from radio stars,** p. 350–355.

Little, C. G. and Maxwell, A.: **Scintillation of radio stars during aurorae and magnetic storms,** p. 356–360.

Journal of Geophysical Research, Volume 57, Number 3, September 1952.

Gibbons, J. J. and Nertney, R. J.: **Wave solutions, including coupling, of ionospherically reflected long radio waves for a particular E-region model,** p. 323–338.

Pramanik, S. K.: **Secular variation of the magnetic field at Colaba and Alibag,** p. 339–355.

Kelso, John M.: **A procedure for the determination of the vertical distribution of the electron density in the ionosphere,** p. 357–367.

Scott, J. C. W.: **The solar control of the *E* and *F1* layers at high latitudes,** p. 369–386.

Manning, L. A., Villard, O. G., Jr. and Peterson, A. M.: **Double-Doppler study of meteoric echoes,** p. 387–403.

Johnson, M. H.: **The relation between electrical and diffusion currents,** p. 405–412.

Kaplan, Lewis D.: **Some comments on L. Elterman's "The measurement of stratospheric density distribution with the searchlight technique,"** p. 426–427.

Elterman, L.: **A reply to Lewis D. Kaplan's comments on density measurements with the searchlight technique,** p. 427–429.
Graham, John W.: **Note on the significance of inverse magnetizations of rocks,** p. 429–431.

Journal of Meteorological Research, Tokyo, Volume 4, Supplementary Number, March 1952.

Koenuma, K.: **On the sea fog in the neighbouring seas of Japan,** p. 1–24.
Izawa, T.: **Vertical distribution of temperature in sea fog,** p. 25–32.
Morita, Y.: **Weather situations during the sea fog observation, 1951,** p. 33–38.
Agari, S., Morita, Y., Ito, N. and Kobayashi, T.: **On the remote recording thermometer used in the sea fog observation 1951,** p. 39–42.
Kamiyama, K. and Moriguchi, M.: **Collection efficiency of fine fibre and infrared spectrometry of fog particles,** p. 43–54.
Aerological Observation Party: **Results of captive radiosonde observation,** p. 55–60.
Temperature Observation Party: **On the meteorological situation around fog proof forest,** p. 61–70.
Morita, Y. and Tabata, T.: **On the sea fog invasion over Nemuro and Kushiro District (1st Report),** p. 71–74.
Ito, N.: **The eddy diffusion near the earth's surface at Ochiishi,** p. 75–76.
Kushizaki, R.: **Dissipation of fog by the heat diffusion from the upper inversion layer,** p. 77–80.
Hakodate Marine Observatory: **Report on the marine observation for sea fog in 1951,** p. 81–120.
Imahori, K.: **On the vanishing mechanism of advection fog and the effect of woods upon fog reduction,** p. 121–142.
Yoshida, J.: **Diurnal change of air and ground temperature on a fog day,** p. 143–150.
Fukutomi, T.: **A theoretical study on the change of liquid water contents of the intruding stationary sea fog due to the capturing action of leaves and branches of the woods in the coastal region,** p. 151–166.
Hori, J.: **On the combined effect of falling drop, temperature, diffusion upon fog reduction,** p. 167–174.
Tabata, T.: **On the general equipment used in the 1951 observation of sea fogs at Ochiishi, Hokkaido,** p. 175–184.
Kuroiwa, Daisuke and Kinoshita, S.: **A new type of fog meter which is carried by balloon and used to measure the liquid water content of fog in the upper air,** p. 185–194.
Tabata, T., Fujita, T., Matsumura, N. and Kuroko, M.: **On a new type of recording fog meter,** p. 195–202.
Chiba, T.: **On the temperature distribution near the ground,** p. 203–234.
Kinoshita, S.: **The drop size distribution of a mountain fog,** p. 235–238.
Ooura, H.: **The capture of fog particles by the forest,** p. 239–258.
Ishida, T., Kusunoki, K., Asada, H. and Imai, H.: **Measurement and analysis of atmospheric turbulence,** p. 259–274.
Tatewaki, M.: **On the vegetation near Ochiishi,** p. 275–292.
Matsui, Y. and Baba, K.: **A sampling investigation on stock of forest near Ochiishi,** p. 293–300.
Matsui, Y.: **Notes on the fog proof coefficient of forest near Ochiishi,** p. 301–320.

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